

Jan 1-1951

# AUTOMOTIVE INDUSTRIES

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**ENGINEERING • PRODUCTION • MANAGEMENT**

**JANUARY 1, 1951**

## ***In This Issue . . .***

**Automatic Transmission Patent Suits**

**Conserving Copper Wire in Generators**

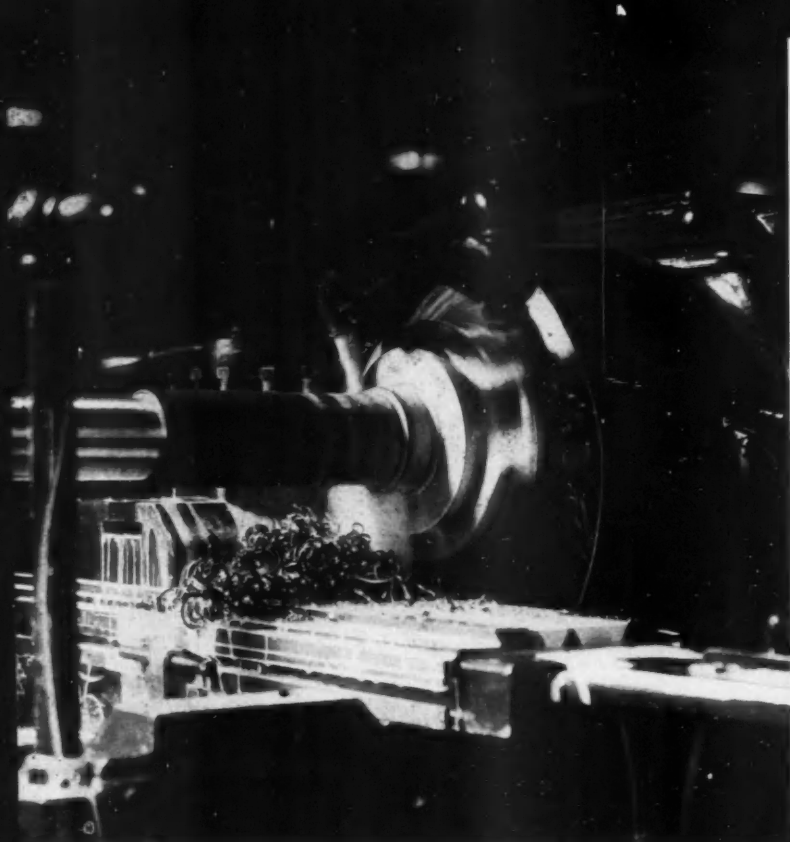
**GMC's Light Duty Trucks for 1951**

**Controlling Aircraft Design Changes**

**High Frequency Ignition System**

*Complete Table of Contents, Page 3*

**A CHILTON PUBLICATION**



## Can this many-purpose cutting fluid solve a problem for you?

● Do you have machining operations that give trouble with every cutting fluid you try? When cutting oils are used, tools and work overheat? With water emulsions or soluble oils, are tool life and finish poor? STANICOOL HD Soluble Oil has taken over many such jobs and has saved tools, parts, and machining time.

As a water emulsion, it has excellent cooling ability... gives finish and tool life approaching what you can get with cutting oil. It can handle many of your heavy cutting operations... save you the costly use of special cutting oils. On top of that, STANICOOL HD gives you the economy of soluble oil and these five advantages:

- Mixes readily
- Does not gum up machines and work
- Is non-irritating to operators' hands

### STANICOOL HD

TRADE MARK

### Soluble Oil

- Is stabilized against odor development
- Has anti-rust qualities

To take full advantage of this many-purpose cutting fluid, call on the services of a Standard Oil cutting-oil specialist. His headquarters are near your plant. How you can benefit by his on-the-spot service is explained at the right.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

## What's YOUR problem?

● Cutting? Stamping? Quenching? Whatever your problem, Standard Oil has a corps of cutting-oil and lubrication specialists located throughout the Midwest to help you solve it. One of these men is near your plant. You can get his services quickly and easily. His wide experience and special training in the use of modern lubricants and cutting fluids will help you make real savings.

Why not arrange, today, for his visit by contacting the nearest Standard Oil (Indiana) office? To start the ball rolling, discuss with him the advantages of:

**STANICUT Cutting Oils**—These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades varying in viscosity and compounding are available, each containing the correct proportions of extreme-pressure and friction-reducing ingredients.

**STANOSTAMP Compounds**—Here are three established products for stamping or heavy drawing operations on either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications.

STANOSTAMPS offer maximum protection for dies and work, can be readily removed in conventional washing equipment.

**SUPERLA Quenching Oil**—From Standard Oil's complete line of quenching oils, this product is recommended for quenching work in systems where cooling facilities are limited and bath temperatures are high. It is a medium-bodied oil of red color. It provides efficient quenching of large forgings.

**STANDARD OIL COMPANY (INDIANA)**



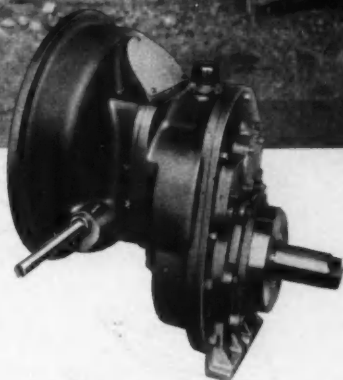


# LOW-COST WAY TO RE-POWER A DRAGLINE!



*Repowered dragline owned by American Aggregates Corp., Indianapolis  
... with a Cotta Reduction Unit*

Here is another example showing how owners of costly machinery can repower their equipment, using Cotta Reduction Units to convert the greater speed of the new engine to the lower rpm required by the old machine. As new machinery rises in price and becomes harder to obtain, investigate this low-cost method of keeping old equipment on the job, performing with new efficiency!



Broad range of ratios

Input torque from 150 to 1350  
foot pounds

For use on cranes, shovels, rock crushers,  
generators, pumps, etc.

## THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem — COTTA engineers will help you select the right unit for best performance. May we work with you?

**COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS**




# COTTA

**HEAVY-DUTY  
REDUCTION UNITS**

*"Engineered-to-order"*

Triple reasons for specifying...

# TRIPLE ALLOY STEELS *containing* **NICKEL**



**1 PERFORMANCE**—Strength and toughness, resistance to wear, fatigue or shock to meet a wide range of requirements, as dictated by design.

**2 VERSATILITY**—Ability to meet varied specification demands after suitable heat treatment.

**3 ECONOMY**—resulting from standard compositions precisely graded to match the engineers' needs.

Experience shows that triple-alloy steels containing Nickel are solving some mighty big problems in many industrial fields. They have established outstanding service records in some of the most exacting applications. The many standard compositions available make it possible to select *accurately*, and with economy, triple-alloy steels to fulfill the requirements of a great variety of applications.

We invite inquiries regarding the selection and uses of triple-alloy steels, containing Nickel.

**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street  
New York 5, N. Y.

# AUTOMOTIVE INDUSTRIES

Jan. 1, 1951

Published Semi-Monthly

Vol. 104, No. 1

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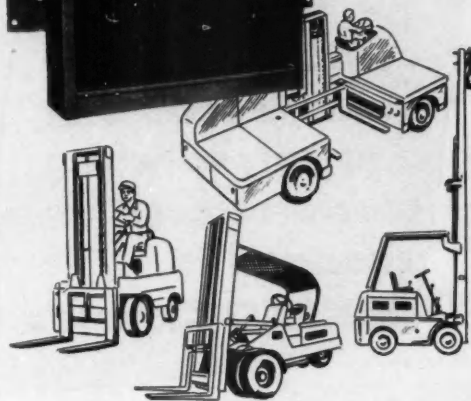
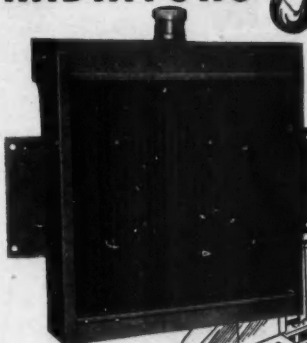
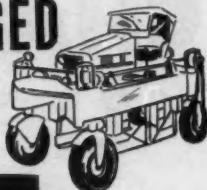
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AUTOMOTIVE INDUSTRIES, January 1, 1951

# MATERIAL HANDLING TAKES RUGGED RADIATORS



## TAILOR-MADE YOUNG DESIGN ASSURES OPTIMUM HEAT TRANSFER FOR LIFT TRUCKS

Many of the biggest names in the lift-truck business rely on Young for their radiator requirements. Thorough analysis of the cooling problems . . . such as heavy, intermittent lifting in heated atmosphere and accompanying stress and strain . . . results in the design and development of radiators especially suited to lift truck applications. Exhaustive testing, high-speed production and controlled quality assure reliable delivery of a product worthy of the Young Quality trade-mark. A Young Sales Engineer will gladly explain the design advantages of Young Radiators at your convenience.

# YOUNG

HEAT TRANSFER PRODUCTS FOR AUTOMOTIVE AND INDUSTRIAL APPLICATIONS.



HEATING, COOLING, AND AIR CONDITIONING PRODUCTS FOR HOME AND INDUSTRY.

U.S. REG. U.S. PAT. OFF.

## YOUNG RADIATOR COMPANY

DEPT. 101-A, RACINE, WISCONSIN

Plants at Racine, Wisconsin and Matteson, Illinois

# CHASER LIFE DOUBLED

... staining and  
leakage problems  
also solved when  
manufacturer\*

**TEXACO Cleartex Cutting Oil**

#### JOB DATA

**Part:** Packing nut

**Operations:** Drilling, forming,  
threading, cut-off

**Machine:** 4-spindle Acme Gridley,  
using high-speed tools

**Metal:** 420 stainless steel

The stainless steel used on this job is one of the toughest metals to machine. Operators reported their greatest difficulty was frequent breakage of the threading chasers, none of which lasted more than three shifts (24 hours). In addition, leakage of machine lubricant into the cutting fluid caused contamination and high oil consumption.

At the suggestion of a Texaco Lubrication Engineer, the competitive cutting fluid and machine lubricant were both replaced by *Texaco Cleartex Cutting Oil*. Chasers now last six shifts (48 hours)—double the life! Because *Texaco Cleartex Cutting Oil* is dual-purpose—designed to serve as both cutting fluid and machine lubricant—contamination has been completely overcome and oil consumption

materially reduced.

Still another advantage gained from the change to *Texaco Cleartex Cutting Oil* is that either steel or brass can be worked without changing oils. *Texaco Cleartex Cutting Oil* does not stain.

Let a Texaco Lubrication Engineer—specializing in machining—help you gain similar cost-saving benefits in your plant. There is a complete line of Texaco Cutting, Grinding and Soluble Oils to assure better, faster, lower-cost machining, whatever the metal or the method of working it.

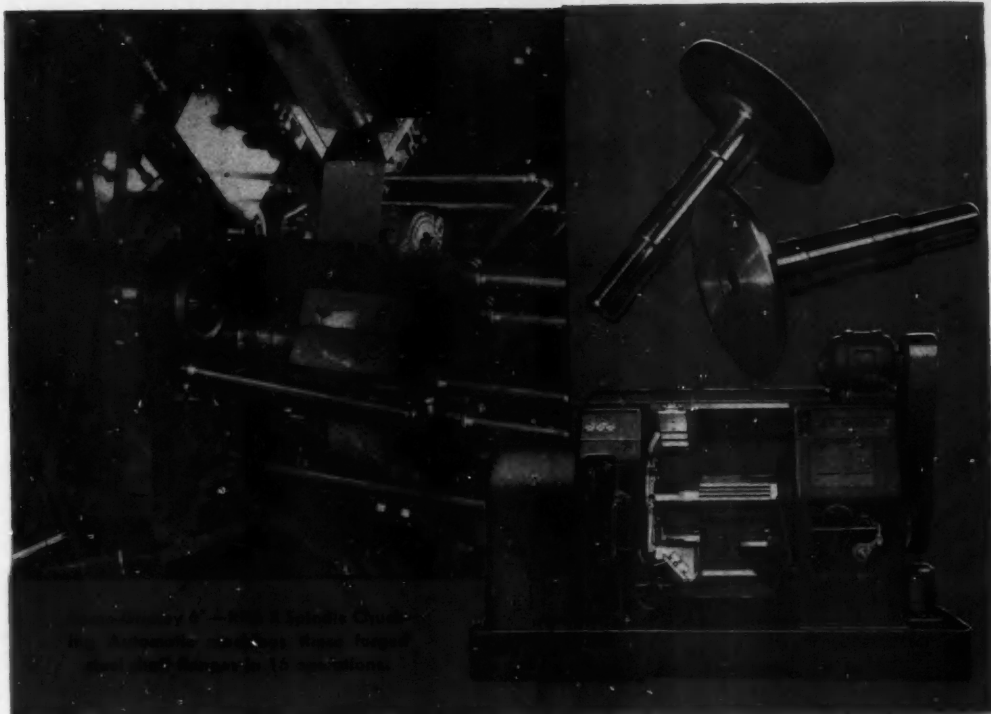
Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

\*Name on request



## TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.



## ACME-GRIDLEY outperforms other automatic 30%

The flange on this forged steel shaft is completely machined—16 operations—in 22 seconds. That's Acme-Gridley performance—30% faster than on the modern competitive multiple spindle automatic it replaced.

The reasons for such performance (and this is by no means an isolated or unusual case) are inherent in the basic design features of the Acme-Gridley. Timesaving carbide-tipped tooling is provided for in the rugged, rigid frame construction; direct and positive camming result in sustained accuracy at high speeds—as fast as modern tools can take. And the machine's adaptability for a wide variety of tooling (including independent power-driven auxiliaries where desirable) permits an economical distribution of cuts to reduce total machining time.

These and many other features are built into every Acme-Gridley Automatic, to give you "more good

pieces in the pan at the end of the day." For more complete details on Acme-Gridley 4, 6 and 8 Spindle Chucking Automatics, ask for Bulletin CM-43.

### JOB-FACTS

**PART**—Forged Steel Shaft Flange (shank and spline previously machined)

**MATERIAL**—40 Carbon Steel

**OPERATIONS**—16

**TOOLING**—Carbide Insert (except drills)

**MACHINING SPEED**—more than 500 s.f.m.

**DRIVE**—through Collet Chuck and Spline

**MACHINE**—Acme-Gridley 6"—RPA 8 Spindle Chucking Automatic

**MACHINE TIME**—22 Seconds (164/hr.)

# The NATIONAL ACME CO

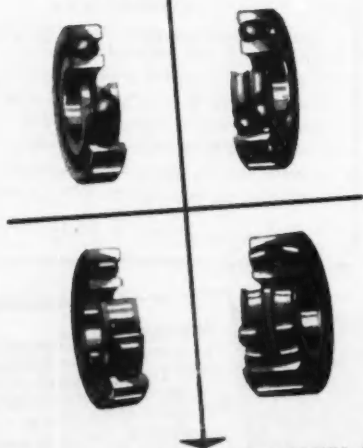
120 BAY 1360 BROADWAY • CLEVELAND, OHIO

Acme-Gridley Bar and Chucking Automatics:  
1-4-6 and 8 Spindle • Hydraulic Thread  
Rolling Machines • Automatic Threading Dies  
and Taps • The Chronolog-Limit, Motor Starter  
and Control Station Switches • Solenoids  
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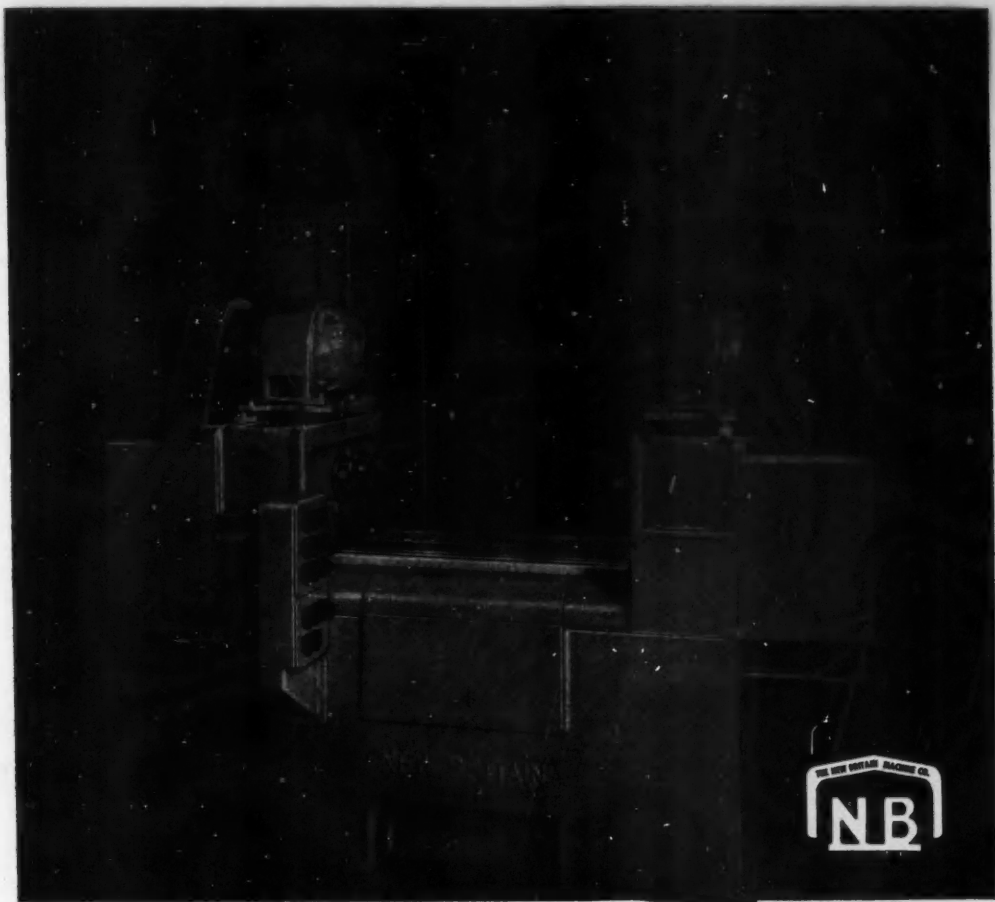
**make preference for a reason your guide  
when you specify  
ball and roller bearings**



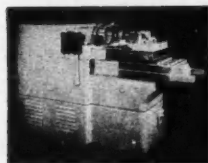
Over the years, products acquire a value above and beyond their mechanical qualities—a value proved by their acceptance throughout industry. This is especially true of SKF ball and roller bearings, preferred by all industry for one or more of eight good reasons. So when you specify, let preference be your guide. 7200

**SKF**  
BALL AND ROLLER BEARINGS

**SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.**  
—manufacturers of SKF and HESS-BRIGHT bearings.



Model 26 & 27 Straight Boring Machine for precision finishing operations on a wide range of work.



Model 36 & 37 Straight and Contour Boring Machine, single point bores, turns, faces, contours, and positively repeats with extreme accuracy.

## **. . . the addition of a new double-ender to our regular line of precision boring machines**

This new double-ender rounds out our established group of precision boring machines and permits us to offer a complete line. The Model 50 is equipped with our exclusive New Britain high speed boring spindles. The hydraulic system is a completely separate unit which can be easily disconnected for cleaning and servicing.

Tooling set-ups and types of pieces machined depend entirely upon the

ingenuity of the production engineer. For this reason we invite your inquiries on this kind of work and offer our complete estimating experience to help you tool up for profitable production.

## **NEW BRITAIN**

*Automatics*

**THE NEW BRITAIN MACHINE COMPANY  
NEW BRITAIN-GRIDLEY MACHINE DIVISION  
NEW BRITAIN, CONNECTICUT**

**AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES  
LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES**



If you want  
the last word  
on Eddy-Current  
Couplings, write  
for your copy of  
this new booklet

Eddy-Current Couplings provide a long list of desirable characteristics including instantaneous response, infinitely adjustable speed control, wide speed range, quiet operation, low power losses, low maintenance cost—without mechanical contact between the driving and driven members—and entirely from AC power.

If you are interested in this modern method of speed control, write on your company stationery for this comprehensive booklet. It presents a down-to-earth explanation of the Eddy-Current Principle, and the operation of the Dynamatic Eddy-Current Water-Cooled Coupling.

**DYNAMATIC**

**CORPORATION**

**KENOSHA  
WISCONSIN**

Subsidiary of **EATON MANUFACTURING COMPANY**, Cleveland, Ohio

Dynamometers • Oil Well Draw-Works Brakes • Adjustable-Speed Couplings • Eddy-Current Brakes  
Adjusto-Speeds • Shovel Clutches • Press Drives • Lift Truck Clutches • Electronic Controls

**16 different  
parts stamped  
from the  
same die!**

Frederick manufactured 16 different standard roller supports—all like the one shown here but with center lengths of varying lengths. Together, the combination with an indexing punch results in the die the work of 16 tooling shops were hard to maintain, but the one die that did the job because each 16 pieces are made in identical conditions. That's why...

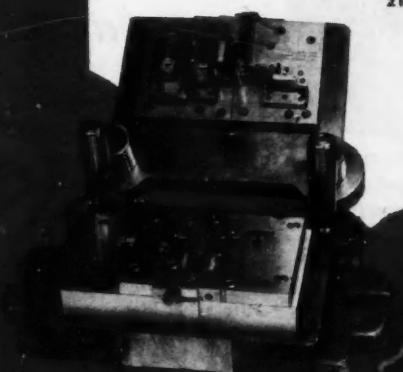
they built the die in a

**DANLY  
PRECISION  
DIE SET**

Danly precision makes every Danly Die Set a reliable base for the finest die work. Time is saved in the die shop because Danly Die Sets are square and true ... they assure longer production runs in the press because precision closure protects die parts. Standard Danly Die Sets are quickly available from a nationwide system of completely stocked assembly branches.\* Just phone for fast delivery, and for the finest in die set precision, always specify Danly.

**DANLY MACHINE SPECIALTIES, INC.**

2100 South Laramie Ave.  
Chicago 50, Illinois



PRECISION DIE SETS

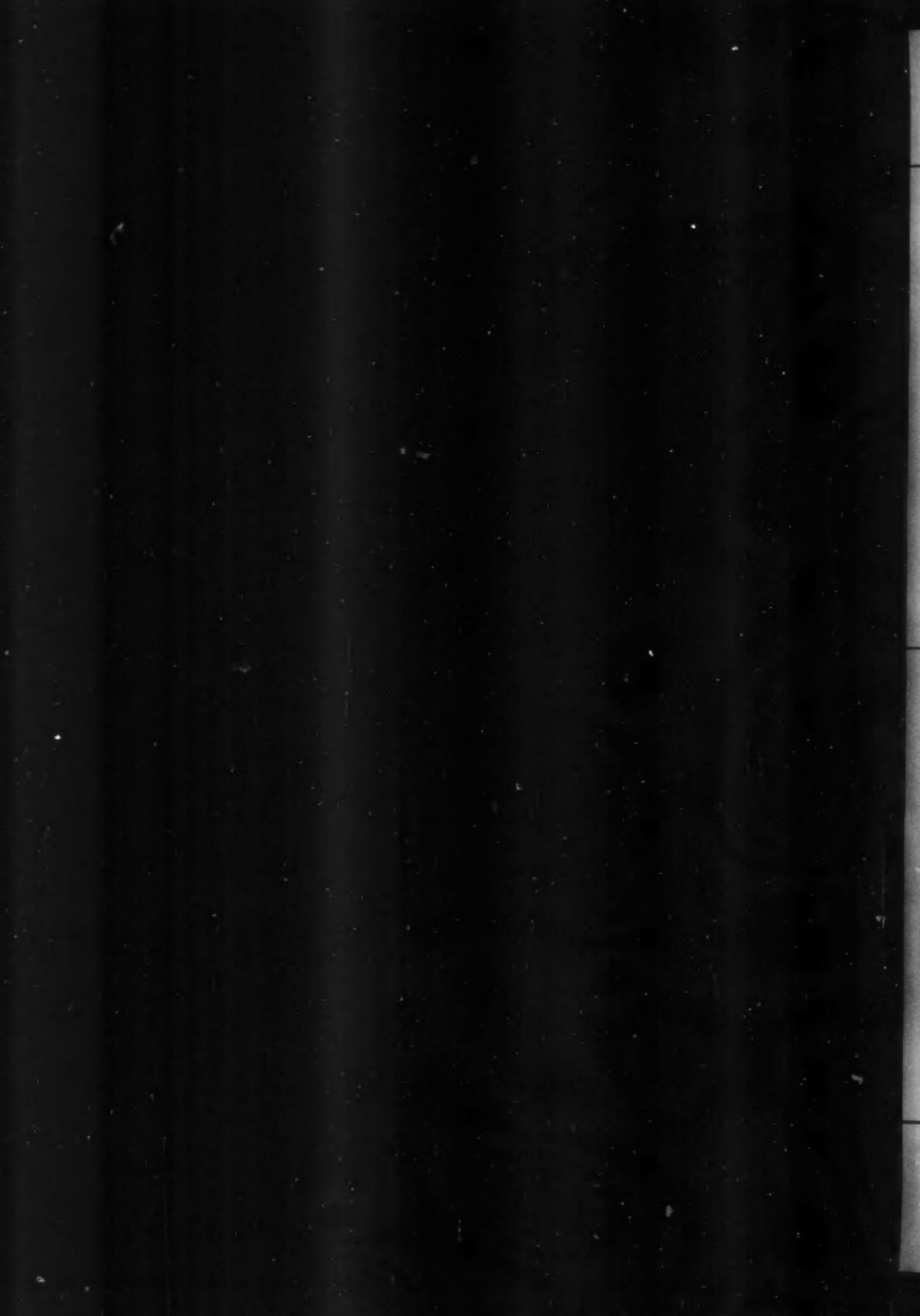
STANDARD AND SPECIAL



\*WHICH DANLY BRANCH IS CLOSEST TO YOU?

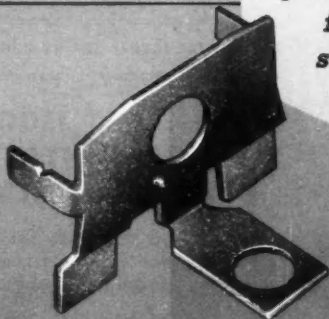
Chicago 50, 2100 South Laramie Ave. \*Chicago 14, 1000 West 21st  
St. Louis 8, 1000 South Laramie Ave. \*St. Louis 1, 1000 South Laramie Ave.  
Kansas City 1, 1000 South Laramie Ave. \*Kansas City 2, 1000 South Laramie Ave.  
Minneapolis 1, 1000 South Laramie Ave. \*Minneapolis 2, 1000 South Laramie Ave.  
New York 1, 1000 South Laramie Ave. \*New York 2, 1000 South Laramie Ave.  
Philadelphia 1, 1000 South Laramie Ave. \*Philadelphia 2, 1000 South Laramie Ave.  
Pittsburgh 1, 1000 South Laramie Ave. \*Pittsburgh 2, 1000 South Laramie Ave.







**16 different  
parts stamped  
from the  
same die!**



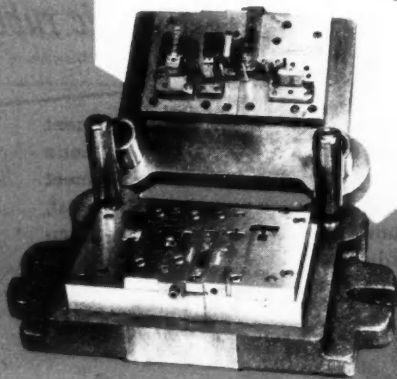
Production required 16 different condenser stator supports—all like the one shown here but with center tongues of varying lengths. Ingenious die construction with an indexing punch made one die do the work of 16. Tooling costs were held to a minimum, but the one die that did the job became just 16 times as vital in meeting schedules. That's why...

they built the die in a  
**DANLY  
PRECISION  
DIE SET**

Danly precision makes every Danly Die Set a reliable base for the finest die work. Time is saved in the die shop because Danly Die Sets are square and true ... they assure longer production runs in the press because precision closure protects die parts. Standard Danly Die Sets are quickly available from a nationwide system of completely stocked assembly branches.\* Just phone for fast delivery, and for the finest in die set precision, always specify Danly.

**DANLY MACHINE SPECIALTIES, INC.**

2100 South Laramie Ave.  
Chicago 50, Illinois



**PRECISION DIE SETS . . . STANDARD AND SPECIAL**



**WHICH DANLY BRANCH IS CLOSEST TO YOU?**

\*Chicago 50, 2100 Laramie Avenue • \*Cleveland 14, 1550 East 33rd Street • \*Dayton 2, 990 East Main Street • \*Detroit 16, 1549 Temple Avenue • \*Grand Rapids, 113 Michigan Street, N. W. Indianapolis 4, 5 West 10th Street • \*Long Island City 1, 47-28 37th Street • \*Los Angeles 54, Ducommun Metals & Supply Co., 4800 South Alameda • Milwaukee 2, 111 East Wisconsin Avenue • Philadelphia 44, 18 West Chelten Ave. • \*Rochester 4, 16 Commercial St.

\*Indicates complete stock





*whatever your job  
for synthetic rubber*

In hundreds of applications, Synthetic Rubber component parts have found their way into every industry. So, no matter what function synthetic rubber must perform in your plant, depend on Acadia parts. They best meet exacting specifications and operating conditions such as moisture, oil, heat, wear and age resistance. Molded, extruded, die-cut to close limits—compounded to meet specific conditions. Acadia engineers will gladly cooperate.

- Seals • Gaskets • Washers • Cups • Channel • Strip • "O" Rings
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**ACADIA** *Synthetic* **PRODUCTS**  
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# MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK

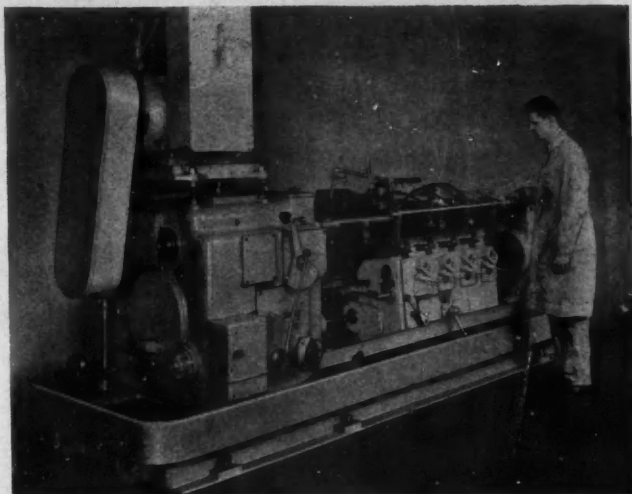
## MODEL "AP" So-swing LATHE MACHINES ELECTRIC MOTOR SHAFTS

**Problem:** To rough turn, face shoulders and groove electric motor shafts machined in small and medium size quantities.

**Solution:** This new Lo-swing Semi-Automatic Lathe, featuring unlimited length of carriage travel thru rack and balanced twin pinion carriage feed, is ideal for machining short and medium run jobs economically. Unlimited carriage travel permits turning of short run jobs having long shoulder lengths with simplified tooling; multiple tooling may be used for long run jobs with short or long shoulder lengths.

The drawings below show a typical two operation tool setup on electric motor shafts which are being machined in small lots. Only the one tool is being used for turning each diameter regardless of the length of cut.

Machine setup is simplicity itself. First, the tool blocks and tools are mounted on the tool slides in the proper relation to each other and for the proper depth of cut. Secondly, two stops are set for controlling length of carriage travel in both directions and one stop for positioning the carriage in relation to the

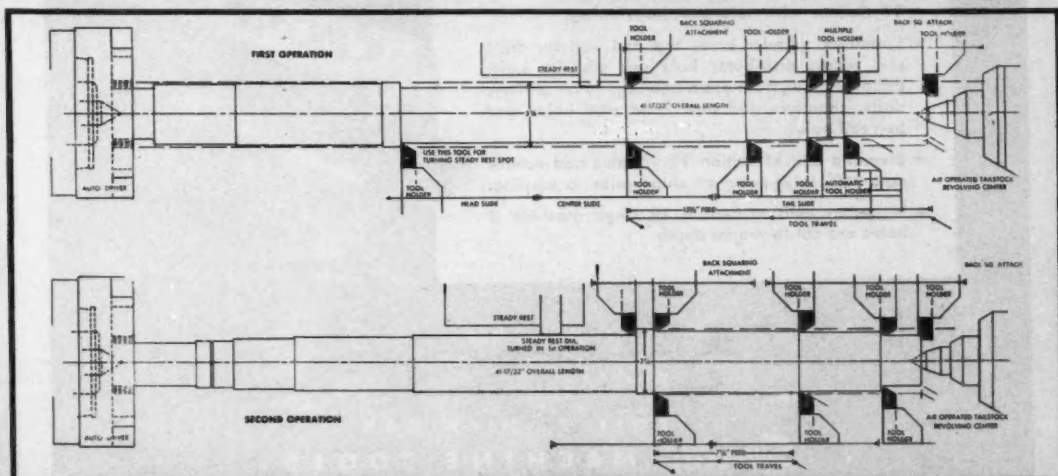


work piece. The lathe is then ready for production.

Tool relief is automatic on the return stroke of the carriage and rapid traverse movements to and from the work are available by throwing a lever.

Investigate the many unique features of this new semi-automatic lathe.

**SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.**



PRODUCTION COSTS ARE LOWER WITH So-swing

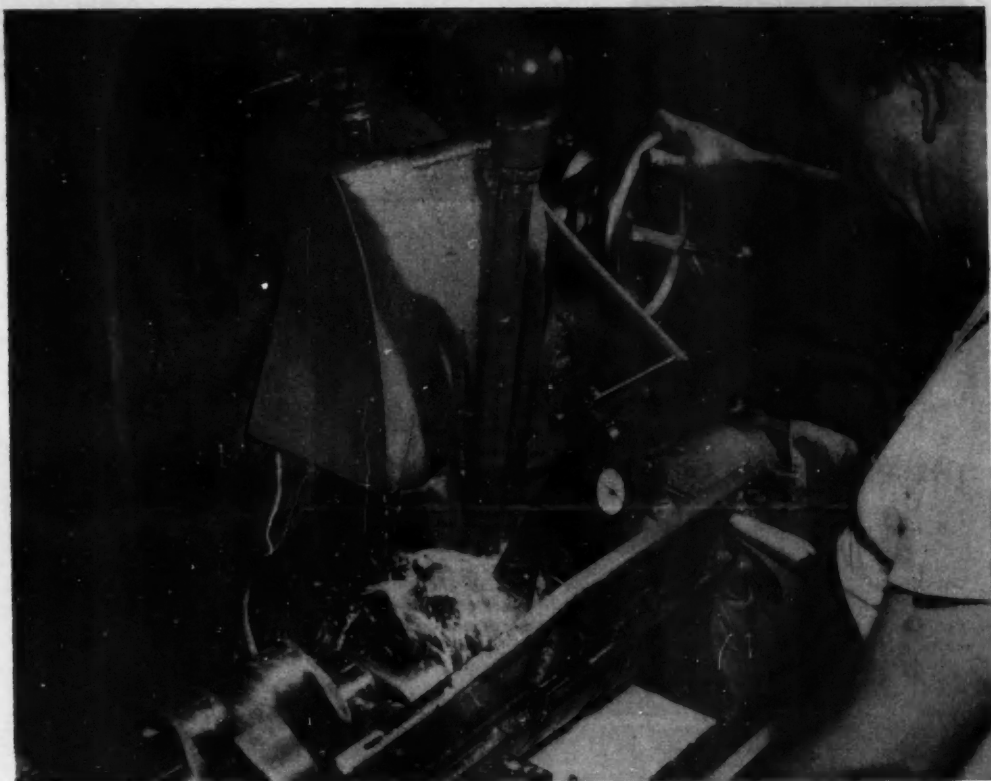
*Another Transfer-matic by Cross*

**Drills, Taps,  
Spot Faces  
and Reams  
Cylinder  
Blocks**

- ★ 100 cylinder blocks per hour at 100% efficiency.
- ★ 13 stations with automatic transferring.
- ★ Chamfers cylinder bores top and bottom; drills and reams distributor hole and dipstick hole; drills oil holes from main bearings to oil gallery; drills, chamfers and taps head stud holes and pan rail holes.
- ★ Cleaning unit at Station 11 vibrates and rotates part 360° to remove all chips prior to tapping.
- ★ Inspection unit at Station 12 stops machine if holes are not to proper depth.

Established 1898

THE **CROSS** CO.  
DETROIT 7, MICHIGAN  
*Special* MACHINE TOOLS



## If a belt could do it better...

Grinding a crankshaft calls for a grinding wheel of definite specifications. But, if it could be done better, faster or more economically...with an abrasive belt, for instance...CARBORUNDUM would be free to recommend the *right* belt impartially. This is because only CARBORUNDUM manufactures a *complete* line of abrasives—and only CARBORUNDUM can make im-

partial recommendation of the *right* abrasive to use in every grinding or cutting operation.

By standardizing on abrasives by CARBORUNDUM you get the benefit of technical advice on abrasive product use and latest developments in abrasives, without regard to production "limitations" in the abrasive field.

**Only CARBORUNDUM**  
TRADE MARK

**makes ALL abrasives to give you the proper ONE**

*"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N. Y.*



# Bendix Products

CREATIVE ENGINEERING

GEARED TO QUANTITY PRODUCTION

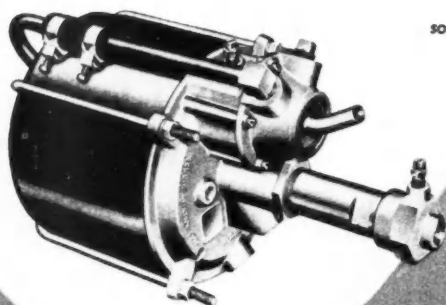
## HYDROVAC

**THE POWER BRAKE PREFERRED ABOVE ALL OTHERS!**

More than two million installations are certainly undeniable proof of any product's popularity. In the field of power braking it means that one—the Bendix Hydrovac—is preferred above all others. Such overwhelming acceptance by the men who service, drive and own the nation's trucks is impressive enough in itself. It further

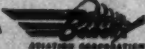
suggests, however, that Hydrovac\* power braking might very profitably be included as original equipment by most manufacturers. If you are interested in taking advantage of this great pre-sold market, write the factory direct for details on Hydrovac—the undisputed leader in power braking.

\*REG. U.S. PAT. OFF.



**BENDIX PRODUCTS**  
DIVISION of

**SOUTH BEND 20, INDIANA**



Export Sales: Bendix International Division,  
72 Fifth Avenue, New York, N. Y.



Bendix Safety and Parking Brake

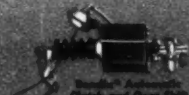


8-427 Power Brake System for Cargo Trucks



Bendix Hydraulic Power Steering

**BUILDERS  
OF THE BASICS  
OF BETTER  
MOTOR VEHICLES**



Bendix Automatic Clutch and Gear Shift Control System



Bendix Vacuum Power Brake System



Bendix Shock Absorbers for Trucks, Buses, and Passenger Cars



# Bendix Products

CREATIVE ENGINEERING

GEARED TO QUANTITY PRODUCTION

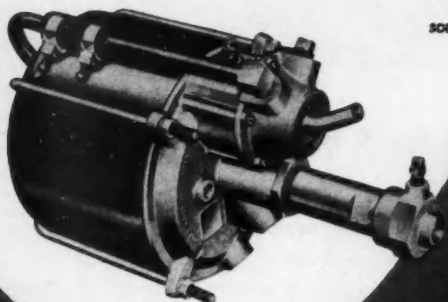
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**THE POWER BRAKE PREFERRED ABOVE ALL OTHERS!**

More than two million installations are currently undeniable proof of any product's popularity. In the field of power braking it would be that one—the Bendix Hydrovac—is preferred above all others. Such overwhelming acceptance by the men who service, drive and own the nation's trucks is impressive enough in itself. It further

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## High Spots of This Issue

### ★ Production Setup at Pesco's New Plant

Over \$3-million has been invested in the new Pesco plant outside Cleveland. The article describes remarkable production flexibility achieved at this plant, where are manufactured hydraulic pumps and motors, d-c electric motors, aircraft accessories, flow equalizers, superchargers and hydraulic power packages. Page 32.

### ★ High Frequency Ignition

The author reminds us that the engines of modern automobiles are sparked by ignition equipment that has undergone no significant change since its introduction 35 or more years ago. He then describes introduction of a high frequency type of ignition system, distinctive in that it requires no breaker points. See page 34.

### ★ Control of Changes in Aircraft Design

Changes in production aircraft design are legion, costly, vital, complex, quick—as in perhaps no other industry. At the Douglas El Segundo plant the fitting of changes into the production picture is vested in a Change Control Dept. E. E. Stoner, Supervisor of the department, here explains its important function and operation. Page 38.

### ★ Two New Gear Materials

This discussion focuses on two materials hitherto not commonly employed for gears. One is Nitralloy N, developed some years ago as a nitriding steel. The other is ductile iron, a post-war development characterized by spheroids of graphite. Page 42.

### ★ Making Large Aircraft Parts

Demonstrated advantages of press forging many aircraft parts formerly cast, extruded or hammer forged have pointed up the need that huge hydraulic press facilities be placed at the disposal of industry. Such a Government-owned and industry-operated plant is found at Adrian, Mich. Described are extremely heavy extrusion and forging presses used in manufacturing research work. Page 50.

### ★ 16 New Product Items And Other High Spots, Such As:

The Le Sabre car designed for the future; use of swaged generator pole shoes to conserve copper wire; GMC 1951 light duty trucks; automatic transmission patent suits to go to trial; a new governor for a wide range of engines; new methods which reduce costs of polishing die castings; and how shortages of aluminum may affect passenger cars.

*News of the Automotive Industries, Page 17  
For Complete Table of Contents, See Page 3*

# Saving Strokes

## MAKES A BETTER PRODUCTION SCORE

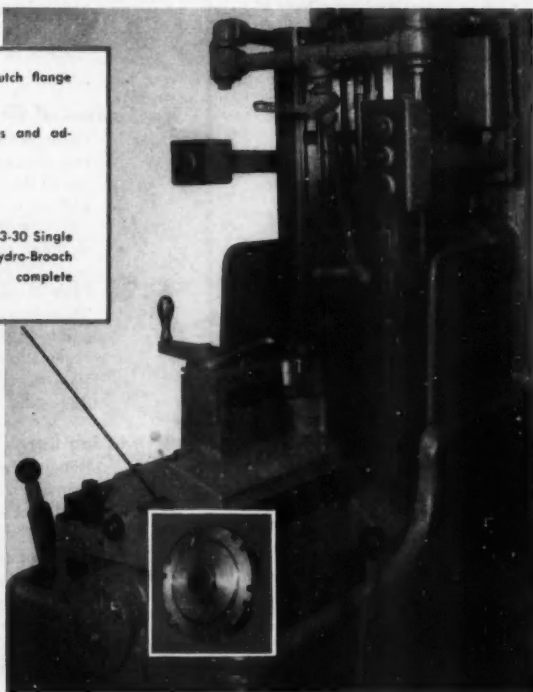
Saving strokes on the golf course nets a lower score; on a broaching machine, a higher rate of production. The machine illustrated here, a CINCINNATI No. 3-30 Single Ram Vertical Hydro-Broach, makes a better production score by broaching three lugs on the part illustrated in one stroke of the ram. ¶ Like many other low cost broaching installations, the work of Cincinnati Application Engineers is evident here. They devised the broach holder with three sets of inserts (cutters), and a simple two-posi-

tion hand clamping index fixture. Each downward stroke of the ram accurately broaches three lugs and the adjacent slots on the periphery of clutch flanges. ¶ Expanded production schedules are not necessary to gain the benefits offered by broaching. Perhaps you can replace present equipment with CINCINNATI Hydro-Broach Machines and continue at the same rate of production at a lower cost. It's well worth investigating, and our field engineers will help you. May we hear from you?

Part name ..	Transmission clutch flange
Material ....	Steel
Operation ..	Broach six lugs and adjacent slots
Depth of cut. $\frac{3}{64}$ "	
Production ..	60 per hour
Equipment ..	CINCINNATI No. 3-30 Single Ram Vertical Hydro-Broach Machine with complete tooling

Left: CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach Machine. Seven sizes available, up to 10 ton broaching force, 66" stroke. Write for Catalog M-1389-2.

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THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO



# News of the AUTOMOTIVE INDUSTRIES

Vol. 104, No. 1

January 1, 1951

## Ford to Spend Billion in Next 3 Years

Ford will spend \$1 billion over the next three years on expansion of facilities and plant improvements. Henry Ford II, in a talk at Dallas, said that the company during the past five years has spent \$600 million on its modernization and expansion program.

## Cadillac Tank Project Ahead of Schedule

Cadillac is well ahead of schedule on its program for building light tanks at its Cleveland tank plant. Production is expected to get under way on a limited basis about next May, several months ahead of the date originally expected. The tank is a 28-ton unit called the T-41 with a ground speed of about 35 mph, and mounts a 76 mm gun. Cadillac is also producing precision parts for the Army in line with the program started three years ago.

## Big Army Tank Award Goes to American Locomotive

The Dept. of the Army has disclosed the award of an Ordnance contract to the American Locomotive Co., Schenectady, N. Y., for the manufacture of medium tanks. The order is for 500 medium tanks, and will involve approximately \$100 million. The Douglas Aircraft Co. got a \$97.4 million contract for model airplanes and spare parts. The Dept. of Defense has announced the awarding to Hiller Helicopters of a substantial production order for Army design H-23A evacuation-type helicopters, bringing to over \$3.5 million the company's present military backlog. GM's Aeroproducts Div. has signed a contract with Boeing Airplane Co. at Wichita to build actuator gear box assemblies for the B-47 bomber.

The Dept. of Commerce has also announced the following Dept. of Defense contracts: for strip-8 shoe, shoe assembly: \$5.7 million, B. F. Goodrich; \$8.2 million, U. S. Rubber Co.; \$8.4 million, Ohio Rubber Co.; \$12.5 million, Goodyear Tire & Rubber Co.; and \$12.5 million Firestone Ind. Products Co. The Ford Motor Co. received contract for buses totaling \$1.9 million. GM received an \$8 million contract for range

finders, and Radioplane Co. a \$3.6 million contract for target aircraft spares.

Buick is negotiating for an order to build cross drive transmissions for General Patton tanks. Ternstedt division of GM has been awarded an initial contract for fire control instruments. Details have not been released, but it is understood that from 1500 to 2000 persons will be required for the job. Tooling is underway and production will start as soon as possible. Kaiser-Frazer has small study contracts for aircraft production at Willow Run, and is actively seeking a contract to build either the C-119 Fairchild cargo plane or the Boeing B-47 six-engine medium bomber. Consideration is also in the works for production of a jet fighter plane. K-F currently has a contract to build sub-assemblies for Lockheed in a plant on the West Coast. K-F studies envision production of aircraft and automobiles simultaneously at Willow Run with the long section of the plant devoted to plane production and the shorter cross section at the end of the plant retained for automobile production. The plant, of course, was designed for aircraft production, and thousands of bombers were built there during the war.

The role that the automotive indus-

tries will play in the partial mobilization program is not yet clear. Major contracts for large units thus far—tanks by Cadillac and aircraft engines by Ford—are centered in government-owned plants away from Detroit. There are still several plants that either are still owned outright or that are under recapture clauses and available to the government for war production.

## 1950 Vehicle Production Over 8 Million

Although final and official figures of 1950 motor vehicle production will not be available for a few days, it is certain that output was just a little over the eight million unit goal. The best estimates indicate that production last year totaled about 8,015,000 units. That phenomenal record would seem to be safe for 1951 certainly and possibly for several years. The industry entered 1951 in a state of confusion and chaos with the outlook even more clouded than it was in the days just prior to World War II. Material allocations are certainly going to affect production as the year goes on, but to what extent nobody knows. Alternate materials are already being used in place of some that are under allocations.



## CADILLAC FOR 1951

Shown above is the series 61 sedan in Cadillac's 1951 line which was described on page 18, Dec. 15, 1950, *Automotive Industries*. Hydra-Matic transmission is standard on all models, and a new business sedan is being offered in series 75, in addition to the touring sedan and the imperial sedan.

## Government Freezes Car Prices as of December 1st

As we went to press, the government on Dec. 19 had ordered a voluntary freeze on all prices in general as of Dec. 1, and three days previously had ordered a roll back on all prices of passenger cars raised since Dec. 1, which affected hikes made by GM, Ford, Chrysler and Nash. Chrysler had increased prices on its 1951 model cars by \$80 to \$195 which followed increases by Ford and GM. The independents had advanced prices at the time of their new model announcements earlier in the year. GM price increases averaged a little less than five per cent while for Ford the figure was about 5.7 per cent. Nash announced a second price increase on 1951 models of \$62 to \$98, or 3.8 to five per cent on Dec. 15.

istance in checking inflation. It said further that when the three price reductions made during the last two years were taken into account the net increase on 1951 models was approximately three per cent higher than the level prevailing in the fall of 1948.

## New Chrysler Contract Based on Living Cost

For the second time since May, Chrysler Corp. has voluntarily gone outside its union contract to negotiate a new wage agreement with the UAW-CIO. In December the company and the union decided to scrap the previous contract which ran until May 4, 1953 and replace it with a new five-year agreement patterned closely after the GM and Ford contracts. Last August, the company voluntarily granted an increase of 10 cents an hour to its hourly-

The loan is not intended to finance cars in dealers' hands, but is intended to finance the company's operations during current slow selling season. RFC will advance to K-F 90 per cent of the wholesale price of cars which are built, but which dealers cannot take because of inadequate financing or overstocking. The cars are to be stored in bonded warehouses as security for the loan and when sold to a dealer the loan must be repaid if sold before next June 1. After that date not only the 90 per cent loan, but an additional 10 per cent repayment is required with the 10 per cent applying to the \$10 million loan granted a year ago.

Originally, K-F had sought a \$38 million extension of its loan in addition to the \$44.5 million granted from RFC last year. RFC has stipulated that the \$15 million of unconditional guarantee

## REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	October		September		October		Ten Months		Per Cent Change		
		1950	1949	1950	1949	1950	1949	1950	1949	Oct. over Sept.	Oct. over Oct. 1949	Ten Months 1950 over 1949
1	New England	32,650	32,530	29,375	29,448	299,448	285,290	+24.55	+24.55	+2.62	+28.98	+36.57
2	Middle Atlantic	107,110	109,887	83,255	86,550	996,550	762,620	+29.62	+29.62	-3.01	+23.91	+38.88
3	South Atlantic	85,312	87,340	82,711	82,711	622,187	427,892	+44.92	+44.92	-4.29	+24.43	+27.94
4	East North Central	147,618	154,227	118,636	1,310,187	1,029,341	1,029,341	+4.45	+4.45	+6.64	+3.67	+34.55
5	East South Central	27,570	29,382	25,490	286,513	197,534	197,534	+4.45	+4.45	+7.19	+39.98	+34.51
6	West North Central	74,450	89,463	53,197	871,443	424,536	424,536	+4.45	+4.45	-28.28	+16.40	+48.37
7	West South Central	45,008	63,858	39,180	487,868	335,567	335,567	+4.45	+4.45	+4.38	+14.28	+35.79
8	Mountain	16,970	19,730	16,518	186,585	137,600	137,600	+4.45	+4.45	-27.18	+20.57	+32.18
9	Pacific	60,563	53,662	50,496	570,823	431,975	431,975	+4.45	+4.45	-7.25	+24.61	+32.78
Total—United States		580,373	625,755	465,765	5,329,986	4,014,061	4,014,061	+4.45	+4.45			

States comprising the various regions are: Zone 1: Conn., Me., Mass., N. H., R. I., Vt. Zone 2: N. J., N. Y., Pa. Zone 3: Del., D. C., Fla., Ga., Md., N. C., S. C. Va., W. Va. Zone 4: Ill., Ind., Mich., Ohio, Wis. Zone 5: Ala., Ky., Miss., Tenn. Zone 6: Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7: Ark., La., Okla., Tex. Zone 8: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9: Cal., Ore., Wash.

Ford, Chevrolet, Dodge and GMC had announced price boosts on 1951 truck models. Ford was first with increases ranging from \$75 to \$275; Chevrolet followed by upping its prices \$45 to \$125. Dodge increases ranged from \$80 to \$295, and GMC announced a few days later that its prices would go up \$50 to \$125 on the light line, or about five per cent, with medium and heavy duty lines increased a similar percentage. All the price increases apply to 1951 models. Truck manufacturers justify the higher prices on the bases of greater increased manufacturing costs. Tires, for example, have gone up greatly during the past year because of the astronomical increase in the price of natural rubber. One company says that tire price increases alone accounted for \$188 of a \$275 increase.

Immediately after the roll back in passenger car prices, GM temporarily froze cars in dealers' hands. The company informed its dealers on Dec. 18 that all cars accepted by dealers from the factory would be upon consignment and would remain the property of GM until released. Previously, GM had pointed out that the order was discriminatory and would be of no as-

sured employees and seven per cent to salaried employees. The new contract is not renewable on any subject until Aug. 31, 1955. In addition to the cost of living escalator clause the contract calls for an immediate wage increase of one cent an hour, an annual improvement factor of four cents an hour, a modified union shop, improved insurance and vacation benefits, and an increase in maximum pension benefits to \$125 a month.

The cordiality and harmony under which the August and December wage talks were concluded was in marked contrast to the bitterness which distinguished the signing of the contract last May after a prolonged strike of 100 days, and apparently signifies a determined effort on the part of Chrysler to establish a model labor relations policy. Hudson is now the only automobile company that does not operate under the cost-of-living type contract pioneered by GM in 1948.

## RFC Makes Stiff Terms for New K-F Loan

The RFC has laid down very stiff terms for its \$25 million additional loan to the Kaiser-Frazer Sales Corp.

of the first loan made by Henry J. Kaiser Co. and Kaiser industries be extended to \$20 million. K-F will open a plant on the West Coast to make war materials according to Henry J. Kaiser, board chairman, and is also seeking ship building and ship conversion contracts to be carried out in shipyards in the San Francisco and Vancouver, Washington area.

## Survey Shows Big Jump in Multiple Car Families

The Crowell-Collier Publishing Co.'s 14th annual automotive survey shows that the percentage of multiple car families in the United States this year nearly doubled the 1949 figure, and that an all-time high of approximately 35,670,000 automobiles are owned by Americans. The survey disclosed that car-owning homes now comprise 73 per cent of the nation's families or a total of 81,725,400 homes, representing about a two per cent increase over last year and almost five per cent since 1948. The big growth, however, has been in multiple car families, these were 4.8 per cent of total car-owning homes in 1948, increased to 6.2 per cent in 1949, and

# INDUSTRIES

jumped to a record 11.1 per cent in 1950. These 3,522,000 multi-car homes add about 7.5 million extra cars to the 28,204,000 owned by single car families, making the grand total approximately 35,670,000 cars owned.

## Chrysler to Triple Size of Los Angeles Plant

Chrysler Corp. plans to triple the size of its Los Angeles assembly plant during 1951. Another 880,000 sq ft of floor space is to be added to the existing plant which covers about 430,000 sq ft. The new space is to be used primarily for assembly of automobile bodies, according to C. C. Rowles, Los Angeles plant manager. The new addition is to be a part two-story structure, the second story to contain 347,200 sq ft and to be used for the painting of bodies and sheet metal.

## Cut in Natural Rubber Hits Truck Tires

The 11 per cent cut in natural rubber consumption for January and 22 per cent in February ordered by the NFA is not likely to affect the supply of original equipment passenger car tires, but what it will do to the truck tire supply is an open question. The order permits the slash in crude rubber production to be made up by use of synthetic rubber so that total usage of new rubber of both types will be about the same as was allowed during November



## MOST BEAUTIFUL

This 1929 modified roadster, voted America's most beautiful hot rod was built by Bill Nickamp of Long Beach. The trophy shown near the car was won by Mr. Nickamp for craftsmanship and beauty of construction at a roadster show held in the San Francisco Bay area.

and December. Satisfactory passenger car tires can be made with a greater percentage of synthetic rubber than has been the practice in the last couple of years. Truck tires, however, require a very high percentage of natural rubber particularly in the large over-the-road highway hauler size.

## Railroads May Fight Cut in Car Freight Rates

Apparently the issue of higher freight rates on new automobiles shipped from assembly plants, as ordered by ICC, is not settled yet. It is

reported that some railroads affected by the order may appeal the decision to the courts. The ICC ruling reduced rates from home factory plants and fixed a minimum rate from assembly plants which, in some instances, was above that prevailing on certain short hauls. Both Ford and GM who had reaped greatest advantage from the lower assembly plant rate have declined to comment officially, but it is understood that if the railroads appeal to a Federal court they may enter the case as interested parties.

## Studebaker of Canada Makes First Postwar Car

Production lines ground to a halt at the Studebaker plant at Hamilton, Ont., Canada, recently to celebrate the production of the company's first Canadian-built Commander model since before the war.

## Hold First Motorama in Los Angeles

More than 40,000 automobile, motorcycle, boat and airplane enthusiasts attended the first annual Motorama, a four-day show held recently in Los Angeles. Featuring custom-built cars, roadsters and hot rods, the show was one of the most complete ever assembled on the West Coast, and 61 manufacturers and distributors displayed their wares.

Several notable racers were shown: Ab Jenkins' Mormon Meteor, famed for its salt bed records; Johnny Parsons' Wynn's Oil Special, 1950 Indianapolis race winner; and the So-Cal Special, said to be the world's fastest hot rod.



## LeTOURNEAU'S NEW TOURNATOW

Shown serving as a switch engine in a factory yard, R. G. LeTourneau, Inc.'s new electric drive Tournatow is powered by a GMC six-cyl Diesel engine developing 186 hp at 1800 rpm driving two generators, one a-c and one d-c, mounted in line with the engine. The d-c generator supplies power to each of the four drive wheels. This power is applied indirectly through a potentiometer type rheostat. The a-c generator supplies power to each of the two motors used to steer the front and rear wheels and to the motor operating the large capacity winch on the rear of the unit.

# News of the AUTOMOTIVE

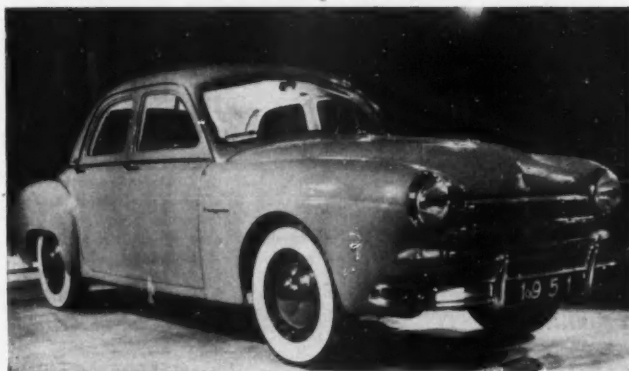
The Motorama is being planned as an annual event to be expanded for greater boat and airplane representation, and 40 per cent of the proceeds from this year's show are to be used to launch a movement aimed at constructing a test timing strip in the Southern California area, according to the producers of the show.

## Fruehauf to Build Plant in Brazil

The Fruehauf Trailer Co. is planning to build a new manufacturing and assembly plant in Brazil. The plant will be the company's first full-scale manufacturing operation in South America. Local labor will be employed and local materials used wherever possible. R. L. Vaniman, vice president in charge of export sales, will also visit Buenos Aires and Montevideo to investigate the possibility of establishing partial manufacturing and assembly plants in those areas to meet truck-trailer requirements. Fruehauf sales this year will be \$140 million, double the net a year ago and \$56 million above the previous peak year of 1948. Fruehauf this year had more than half of all the truck-trailer business in the United States.

## Name E. B. Newill Chairman of Aircraft Industries Group

E. B. Newill, GM vice president and general manager of its Allison Div., has been elected chairman of the board of governors of the Aircraft Industries Association, succeeding La Motte T.



**FRENCH FRIGATE**

The Renault Frigate is a six-passenger model with a maximum speed of 80 mph, a gasoline consumption of 23 to 24 mpg at an average speed of 47 mph, and weighs 2420 lb.

## 1950 NEW PASSENGER CAR REGISTRATIONS\*

Arranged by Makes in Descending Order According to the 1950 Ten Months' Totals

MAKE	TEN MONTHS									
	Units					Per Cent of Total				
	October 1950	September 1950	October 1949	* 1950	1949	1950	1949	1950	1949	1949
Chevrolet.....	128,778	127,862	103,786	1,208,829	866,682	22.68	21.59			
Ford.....	113,218	119,211	81,449	1,011,081	680,450	18.97	16.20			
Buick.....	41,980	60,180	33,145	448,903	317,355	8.38	7.91			
Plymouth.....	67,981	73,094	81,081	432,614	430,692	8.12	10.73			
Pontiac.....	35,150	41,864	30,044	372,420	266,567	6.99	6.84			
Oldsmobile.....	29,418	34,135	24,871	310,776	223,823	5.83	5.56			
Mercury.....	25,853	29,030	19,546	288,491	148,321	5.94	3.70			
Dodge.....	31,340	37,403	30,864	243,813	222,864	4.97	5.85			
Studebaker.....	18,065	25,791	21,133	229,078	164,700	4.48	4.10			
Nash.....	14,805	9,722	11,774	152,324	113,741	2.86	2.83			
Chrysler.....	16,997	16,665	13,492	119,682	106,233	2.78	2.70			
Hudson.....	4,605	5,868	7,911	118,600	118,510	2.22	2.95			
DeSoto.....	12,367	12,482	10,890	89,880	85,632	1.89	2.13			
Cadillac.....	11,288	12,394	7,050	84,096	67,999	1.58	1.69			
Kaiser.....	9,496	12,286	3,353	75,052	81,591	1.41	1.29			
Packard.....	7,396	3,515	7,831	59,726	84,140	1.12	2.10			
Willis.....	2,560	3,375	2,320	29,989	24,692	.56	.62			
Lincoln.....	2,700	2,853	3,243	29,619	32,088	.54	.60			
Frazer.....	244	476	567	11,444	14,842	.21	.37			
Crosley.....	573	624	642	6,004	9,016	.11	.22			
Henry J.....	5,330	.....	.....	5,330	.....	.10	.....			
British Austin.....	345	427	471	4,678	2,737	.09	.07			
British Ford.....	214	260	160	1,467	4,889	.03	.12			
Misc. Foreign.....	1,101	1,261	377	7,304	2,890	.14	.07			
Misc. Domestic.....	359	419	25	1,567	1,513	.03	.04			
Total—All Makes.....	580,373	625,755	465,765	5,329,956	4,014,061	100.00	100.00			

\* Based on data from R. L. Polk & Co.

## Renault Announces New Frigate

The French Government-owned Renault company has produced an entirely new model, the Frigate (see cut on this page) and is planning for the production of 250 units a day. As no more ground is available at Billancourt, France, where Louis Renault started his three-man factory on his father's country estate, new ground will be broken at Flins, 30 miles to the west of Paris. Although the new Frigate has been publicly presented in Paris, in the presence of two ministers of State, Renault has not announced the price, the only statement being "when it does come it will be a surprise."

The Frigate has integral body and frame and all four wheels are independently sprung by means of coil springs, supplemented by telescopic hydraulic shock absorbers. The new model is powered by a four-cyl overhead valve engine, mounted in front with a bore and stroke of 3.34 by 3.46 in.

The Frigate's wheelbase is 110 in.; overall length 182 in.; width 68 in., and height 60 in.

## Gemmer Mfg. to Build Plant Addition

The Gemmer Mfg. Co. has started construction of a one-story 70,000 sq ft addition to its Detroit plant. The extra space will be used to expand production of Gemmer's new Hydraguide hydraulic steering gear which will be offered on

# INDUSTRIES

the 1951 Chrysler models. In addition to the \$400,000 cost of the building, Gemmer expects to spend an additional \$600,000 over the next few years for new machinery and equipment.

## **MEMA Names Officers for 1951**

The Motor and Equipment Manufacturers Association has named the following as officers for 1951: President, J. M. Wells, Ingersoll-Rand Co., New York, N. Y.; vice-president, G. O. Wherley, the Timken Roller Bearing Co., Canton, O.; secretary, G. W. Andrews, Andrews Manufacturing Co., St. Louis, Mo.; and treasurer, C. P. Brewster, K-D Manufacturing Co., Lancaster, Pa. The 1951 board of directors are G. W. Andrews, Andrews Manufacturing Co., St. Louis, Mo.; W. S. Coles, the Shaler Co., Waupun, Wis.; W. J. Greene, the L. S. Starrett Co., Athol, Mass.; D. L. Millikin, Rust Master Chemical Co., Boston, Mass.; S. G. Phillips, the Dole Valve Co., Chicago, Ill.; G. W. Sherin, E. I. du Pont de Nemours & Co., Wilmington, Del.; R. L. Smith, Pyrene Manufacturing Co., Newark, N. J.; R. A. Stranahan, Jr., Champion Spark Plug Co., Toledo, O.; F. G. Wacker, Jr., Ammco Tools Inc., North Chicago, Ill.; J. M. Wells, Ingersoll-Rand Co., New York, N. Y.; G. O. Wherley, the Timken Roller Bearing Co., Canton, O.; and E. J. Wilcox, J. H. Williams & Co., Buffalo, N. Y.

## **Crosley Completes Deal for Mexican Assembly**

Crosley Motors, Inc., has concluded a deal with Equipos Automotrices, S. A. to assemble Crosley automobiles at its plant in Monterrey, Mexico, for sale through distributors who have been appointed in major Mexican cities. The Mexican company has been assembling Reo trucks at the Monterrey plant for the past two years. Production of Crosley cars has already started at the rate of five a day and will be increased to 15 cars a day soon.

## **Nash Aids Research in Nuclear Fission**

Nash-Kelvinator has announced a grant of \$100,000 to the University of Michigan for its Phoenix Project in atomic research. The grant is to be applied toward basic research primarily in two broad phases of nuclear investigation: the preservation of food and the improvement of metal surfaces and coatings. The grant will be paid over a five-year period.

## **Ford Salaried Workers to Get Yearly Raise**

The Ford Motor Co. has established a policy of automatic annual pay increases, for certain salaried employees, and is liberalizing its group insurance program. The move is being made to give salaried workers the same type of annual improvement factor granted to hourly-rated workers under the union contract. Starting next June employees earning \$650 or less monthly and not covered by a union agreement will get yearly raises of three per cent or \$7 a month, whichever is greater, through June 1, 1954. The company has already

of the National Advisory Committee for Aeronautics, has been named to receive the 1950 Daniel Guggenheim Award, it was announced jointly by the American Society of Mechanical Engineers, Institute of the Aeronautical Sciences, and Society of Automotive Engineers.

## **Jacklin Designs New Engine**

Several new engine developments appear in the offing, although no definite information is available at this moment. For one thing, we have been told to watch for the announcement of a new Diesel engine in about 60 days, to be



## **FORD POURS**

At Ford Motor Co.'s Rouge steel mill a workman pours a ton of steel into an ingot mold. The open hearth furnaces set two new production records for Ford, and are currently producing at the rate of 100,000 tons a month.

granted an additional three per cent of the base salary to employees earning less than \$675 a month who are assigned to seven-day operations. The new benefits are in addition to cost of living allowances, increased shift premiums, higher retirement benefits, and greater company absorption of hospital and surgical costs. Death, disability and accident and sickness benefits have also been stepped up beginning Jan. 1 at no increased costs to employees.

## **Name Hugh Dryden to Get 1950 Guggenheim Award**

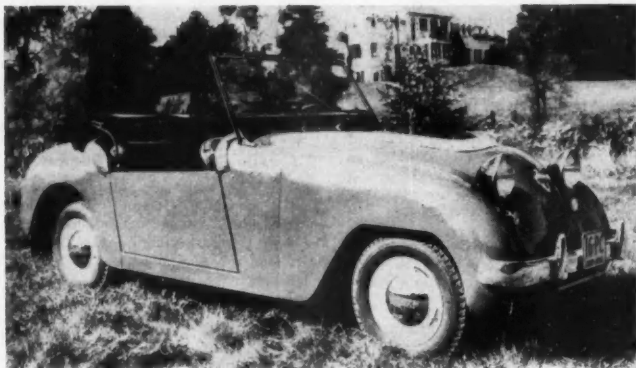
Chosen for his outstanding leadership in aeronautical research and fundamental contributions to aeronautical science, Dr. Hugh L. Dryden, Director

produced by a large automotive manufacturer. Recently, too, we were advised by H. M. Jacklin, of Jacklin Engineering Co., formerly of Purdue, that he has designed a compact opposed piston two-stroke engine for heavy duty service. Based on design data only, this engine is said to have unusual characteristics of high output and fuel economy in a more compact and lighter weight package.

The Jeco engine is said to have superior scavenging due to the use of a new form of direct-injection combustion chamber. One version of this engine may be operated with a compression ratio of 9 to 1 and supercharged to two atmospheres, delivering around 65 bhp per cylinder or 260 bhp for a four-cylinder engine. To our knowledge the



# News of the AUTOMOTIVE



## SUPER SPORT

Crosley Motors, Inc., has announced that their 1951 Super Sports model, shown above, is available with a new 10 to 1 compression ratio Quicksilver engine as optional equipment. This engine employs the Vitameter produced by Thompson Products, Inc.

engine is only in its design stage and no prototype has been built.

aircraft regardless of extreme weather or visibility conditions."

## Lima-Hamilton Now Part of Baldwin Locomotive

The assets and business of the Lima-Hamilton Corp. recently became a part of the Baldwin Locomotive Works which under the name of Baldwin-Lima-Hamilton Corp. will carry on all of the activities formerly conducted by both companies.

## AiResearch Mfg. Co. Forms New Division

AiResearch Manufacturing Co., Los Angeles, has announced the formation of a new division, AiResearch Manufacturing Co. of Arizona. \$1½ million have been appropriated for the project, and a new 60,000-sq ft plant to be built in Phoenix, Arizona, is expected to be completed about June 1951.

## Award 1950 Collier Trophy to William Lear

William P. Lear was named as the recipient of the 1950 Robert J. Collier Trophy by the National Aeronautic Association in Washington, D. C. Mr. Lear, chairman of the board of directors and director of Research and Development of Lear, Inc., received the award from the President of the United States "... for his outstanding achievement in the development, perfection, application and production of the Lear F-5 Automatic Pilot and Automatic Approach Control Coupler System, which makes possible the safe landing of jet

## Standard Coil to Acquire Kollsman Div. of Square D

Standard Coil Products Co., Inc., has arranged to acquire from the Square D Co. the latter's Kollsman Div., manufacturer of aircraft instruments. The business will continue to be operated with the same personnel and in the same plants, and while the terms of the contract were not announced, the purchase price was stated to be around \$5 million.

## Free Entry of British Cars Problem for Canada

Free entry of British cars in the Canadian market is creating a future problem for the Canadian automobile industry and is a serious matter for employees of the industry, D. C. Gaskin, vice president and general manager of the Studebaker Corp. of Canada, said. Canadian production of British cars imported into Canada during the first eight months of this year would have afforded employment for 16,483 Canadian workers. Mr. Gaskin stated in a message sent the company's employees. Canadian production of that number of cars would also have put salaries and wages amounting to \$28,693,892 into Canadian workers' hands, he said.

"None of us in the industry would have any objections to British cars being sold in Canada if they were being sold on a competitive basis with the cars built by Canadian labor and using Canadian materials," he continued.

"Cars produced in England are being built with labor at an average rate of about 65 cents an hour. The average in our own plant is now \$1.42 an hour."

## Bendix Aviation Buys Plant in Iowa

The Bendix Aviation Corp. has bought the property and facilities of the Victor Animatograph Corp., Davenport, Iowa, including a modern factory building, to handle increased production of aircraft instruments and accessories. Containing 154,000 sq ft of manufacturing space, the plant is to become a new division of the corporation, increasing to 17 the number of Bendix divisions, exclusive of subsidiaries.

## Mexico to Relax Ban on U. S. Vehicles

A report from Mexico says that the ban on import of automobiles from the United States that has been in effect for the last three years has been abandoned. Mexico's dollar balance is now said to be stable, permitting a flexible system of import permits for cars and other items from the United States.

## Briggs Adopts GM Wage Formula

Briggs Mfg. Co. is the latest large company in the automobile industry to adopt a five-year contract containing a provision tying hourly wage rates to fluctuations in the cost of living. The new Briggs contract is very similar to that of Chrysler Corp. and includes a wage raise of one cent an hour plus improvement in pensions and social security. It also contains the four cent hourly annual improvement factor. The new agreement replaces a three-year contract signed last year which was scrapped in favor of the new agreement.

## Classified Jeep as Passenger Car for Freight Charges

When a difference of \$2627.95 occurred in freight charges for a shipment of Jeeps by the government over the Union Pacific Railroad, the government insisted Jeeps were freight cars, and the railroad, that they were passenger cars. The railroad sued the government for this difference between these two freight classifications, and the United States Court of Claims finally held that a Jeep was a passenger car and the railroad entitled to the freight charges earned under that classification.



# INDUSTRIES

## Ingersoll Products Bids for Navy Contract

Ingersoll Products Div. of Borg-Warner at Kalamazoo, Mich., is negotiating with the Navy to design and construct two armored vehicles and two personnel carrying vehicles for amphibious operations. It is understood that the negotiations are preliminary to selection of four companies, including the B-W division, to build such vehicles.

## Willys Consolidates Parts and Service

Willys-Overland has consolidated its parts and service department into one operation in line with general practice in the automobile industry. Robert Montgomery, general parts manager since last year, has been appointed to head up the new operation.

## Ford Adding Two More Parts Depots

Ford has acquired a 16-acre site at Memphis, Tenn., for a service parts depot and sales office building. Construction will start soon on the building which will be 240 ft by 420 ft with more than 100,000 sq ft of floor space. It will be equipped with the latest type of material handling equipment and is scheduled for completion about next June 1. The company will also build a new parts depot at Dallas with 120,000 sq ft of space.

## New Lodge and Shipley Lathe Speeds Jet Output

The new Lodge and Shipley lathe (see New Products Section of this issue) is being used to speed Pratt & Whitney jet engine output. The Pratt & Whitney Co., E. Hartford, Conn., had the problem of facing the huge thin-walled "shroud" of its jet engine. Lodge and Shipley assigned company engineers to work with the Pratt & Whitney Experimental Div. to develop a lathe fully applicable to this type of work. The large diameter of this "shroud" posed no serious problem, but the thin walls and the short length made the job extremely difficult. Lodge and Shipley engineers came up with the basic T-design which appeared to offer real possibilities. Close cooperation with the Pratt & Whitney Experimental Div. resulted in final approval of the present design and actual production of this radically new lathe followed. Wm. L. Dolle, president, Lodge and Shipley, predicts extensive application of machine as a general purpose lathe.

## Tigges Named Adviser to NPA

The American Society of Tool Engineers has been notified of the appointment of Herbert L. Tigges, president of the ASTE as adviser and consultant on machine tools to the National Production Authority in Washington. Mr. Tigges, who is also executive vice-president of Baker Brothers, Toledo, has for some time headed the Machine Tool Industry Mobilization Reserve group, initially set up as an "unofficial group" at the instigation of the NSRB. Questioned as to the significance of his appointment, Mr. Tigges pointed out that organization of the machine tool section at NPA was a normal move at this time on the part of NPA since "machine tools are needed first before you can make anything."

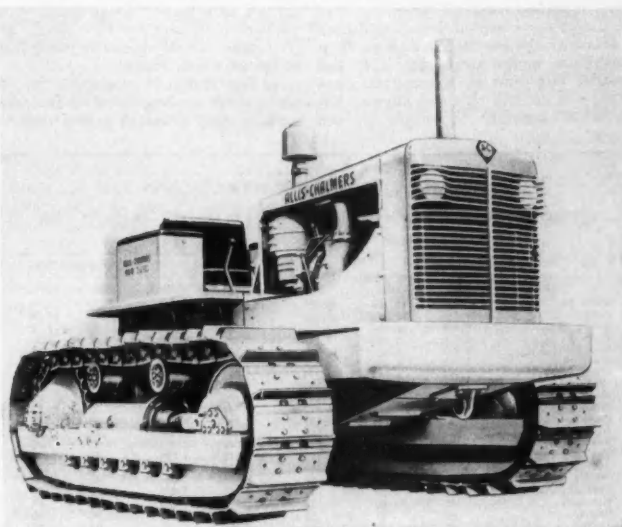
## GM Finds Institute of Industrial Health

GM has announced a \$1.5 million research project to promote studies for better health among industrial employees. The project will be set up in cooperation with the University of Michigan and will be called the Institute of Industrial Health. Broad objectives will be research, education, and

service in industrial medicine, health and safety. Findings of the Institute which will deal with prevention, diagnosis, and treatment of occupational diseases will be made available to all companies and all employees of American industry. Of the \$1.5 million granted for the project, a total of \$500,000 will be used as needed for equipment. In addition, GM will make an annual grant of \$100,000 for 10 years to pay for fellowships, scholarships, added faculty personnel, and a clinic and refresher course for doctors, nurses, and personnel in auxiliary services.

## Martin Shows Specs for New Plane to Military

The Glenn L. Martin Co. has presented specifications for a new combination twin-engine trainer, staff transport and utility cargo airplane whose basic mission is to carry 15,000 lb of cargo over a combat range of 1500 mi at 270 mph to the U. S. Navy and U. S. Air Force. Designated the Martin Military Airlift 4-0-4, the airplane is said to have the characteristics of range, payload and versatility comparable to those formerly assigned to four-engine aircraft. Two versions of the Airlift 4-0-4, using different types of engines,



## ADDED BY ALLIS-CHALMERS

Known as the HD-9, shown above, and HD-15, two new crawler tractors are being added to the Allis-Chalmers line. The HD-9 weighs 18,500 lb, and has a drawbar horsepower rating of 70. The larger HD-15 weighs 27,500 lb, and develops 102 hp at the drawbar. Both have six speeds forward and three reverse, and are powered by GM Diesel engines.

# News of the AUTOMOTIVE INDUSTRIES

are planned: one would be powered by conventional piston engines, the other by turboprop powerplants.

## GM to Help Finance J. & L. Expansion

GM is loaning \$28 million to the Jones & Laughlin Steel Corp. to help finance the steel company's \$228 million expansion program. GM has also agreed to take an extra 240,000 tons of steel a year from J. & L. as long as it is operating at full capacity. The GM move is not the first time an automobile company has helped finance the steel industry. Packard and Kaiser-Frazer aided steel mills in the postwar period.

## FTC Faces Ticklish Decision In Spark Plug Case

The conclusion of a three-day hearing has pinpointed the fact that the Federal Trade Commission is faced with a ticklish and complex decision. This is whether to uphold or reverse a trial examiner's findings and recommend order relating to spark plug pricing. On trial is the present practice of preferential pricing for automobile manufacturers both for assembly and for resale to their dealers for replacement use. This, the FTC says, is unfair competition on the part of the bigger companies who hold contracts with the automobile makers. The companies under attack say that the smaller plug and parts manufacturers could not get the business anyway because of inability to supply in the

volume demanded.

The hearings hinged on a continuance of a complaint originally issued against the Champion Spark Plug Co. in 1939, and subsequently revived and amended in 1947. It attacks the firm's pricing policies as violations of the Robinson-Patman and the Federal Trade Commission Acts. Also involved are the AC Spark Plug Div. of General Motors and the Electric Auto Lite Co.

Industry believes that the fight involves far more than whether a manufacturer may sell spark plugs to automobile manufacturers at lower prices than to regular jobbers and wholesalers. The crux of the matter, say the respondents, lies within the wording of the proposed order against Champion which forbids sale "to any purchaser at a price different from the price charged any other customer . . . who either (a) purchases . . . for original installation . . . or (b) for resale in competition with others."

This, the respondents argue, forbids all functional pricing and outlaws discount practices as old as industry itself. This is denied by FTC counsel who says it would have no effect on normal discount practices.

The biggest fear of industry, however, is that the spark plug orders, if approved by the FTC, will set a pattern and base for similar action and rulings with respect to all parts which automobile manufacturers buy, and from there would spread to other fields of industry and trade.

As far as that is concerned, the proposed order against AC does just that. It states that different prices may not

be charged different customers "of AC products for original installation . . . (or) for resale in competition." The order thus covers not only spark plugs but about 30 products including ammeters, oil filters, fuel pumps, speedometers, die castings and other items.

If the proposed orders are entered, industry representatives held, there would be two sweeping effects. One would be to force the prices of new cars upward as much as \$200. The other would be to force greater integration of automobile factories through the building of their own plug and parts plants—with disastrous effects on present parts makers.

Ford Motor Co. officials have pointed out that the latter action would be almost compulsory so far as their firm is concerned, particularly with respect to spark plugs. GM makes its own in the AC division and Chrysler obtains its plugs from its connections with Auto Lite. Thus, Ford must obtain spark plugs at a price comparable with those for Chevrolet and Plymouth.

The director of purchases for Ford testified that no one "would contend that if prices were raised to us to 26 cents instead of six cents that we would ship cars without spark plugs . . . The only effect which would ultimately happen would be that we . . . would be forced to manufacture them ourselves."

No apparent solution or meeting of the minds seemed near at conclusion of the hearings. Industry did win one concession; the trial staff did definitely go on record as having no intent to knock out different pricing to wholesalers and dealers. The staff also said that it would have no objection to writing a provision into the proposed orders permitting split-function distributors to remain in business.

But the fact remains that the trial staff still wants an order which would restrict price differences to those which can be justified by costs, including those between buyers for assembly and wholesalers, and between distributors of replacement plugs all the way down to the dealer level. Also under attack in the spark plug cases is the practice of granting preferential prices to certain types of distributors such as oil companies.

It is also charged by the FTC that plugs are sold to car manufacturers on a tie-in basis. Attorneys for the FTC charged that losses were made on original equipment sales but were made up on the replacement orders. Respondents have pointed out that if anything were added to replacement prices, they could not compete with the two-score plug manufacturers who sell only in the replacement market.

## 1950 NEW TRUCK REGISTRATIONS\*

Arranged by Makes in Descending Order According to the 1950 Ten Months' Total

	TEN MONTHS					
	Units				Per Cent of Total	
MAKE	October 1950	September 1950	October 1949	1950	1949	1950 1949
Chevrolet	38,873	49,134	29,307	258,751	290,955	36.71 37.04
Ford	29,184	31,844	21,383	227,864	199,713	27.24 26.28
International	8,404	11,269	6,274	66,061	70,127	8.58 7.72
G. M. C.	8,236	8,249	7,149	66,323	66,976	8.58 8.56
Dodge	10,321	10,821	10,549	79,630	90,482	8.22 12.25
Studebaker	2,253	4,253	4,389	38,560	47,000	4.11 5.85
Willys-Overland	1,486	1,748	1,126	12,688	16,254	1.33 2.02
White	1,241	1,243	798	9,661	8,938	1.00 .96
Nash	697	778	767	7,523	8,524	.78 .69
Willys-Jeep	758	686	877	7,257	12,463	.75 1.55
Diamond T	544	535	367	4,797	4,444	.50 .50
Divco	384	439	368	3,418	3,106	.35 .36
Reo	405	440	384	3,049	3,451	.31 .33
Brodway	240	193	180	1,945	1,296	.16 .16
Autocar	192	149	124	1,715	1,373	.18 .17
Pontiac	80	83	80	1,281	434	.13 .09
Federal	169	83	60	1,196	1,000	.13 .12
Kearfoot	60	82	31	622	530	.06 .05
Crosley	36	23	83	363	779	.04 .18
Starling	37	34	16	296	193	.03 .02
F. W. O.	30	17	11	255	296	.03 .04
Misc. Domestic	142	189	296	1,196	2,492	.12 .32
Misc. Foreign	26	34	.....	213	.....	.04 .....
Total—All Makes	101,166	112,734	88,390	966,954	903,482	100.00 100.00

\*Data from R. L. Palk & Co.

# Men in the News

**Fruehauf Trailer Co.**—The election of L. C. Allman as executive vice-president was announced. C. L. Schneider has been elected vice-president in charge of sales.

**E S B International Corp.** (newly organized by the Electric Storage Battery Co.)—S. W. Rolph has been named president and director; E. C. Kline, executive vice-president and director; J. B. Clark, vice-president and director; J. E. Sheridan, vice-president and director; E. J. Dwyer, secretary and director; E. S. Maiden, assistant secretary-treasurer-controller; C. E. Murray, director; C. F. Norberg, director; D. N. Smith, comptroller; and E. W. Williams, treasurer.

**General Motors Corp., Buick Motor Div.**—Verner P. Mathews has been appointed chief engineer.

**Doehler-Jarvis Corp.**—James Gerity, Jr., president of the Gerity-Michigan Corp., Adrian, Mich., has been elected a director.

**Bendix Aviation Corp.**—Donald M. McGrath has been appointed general manager of the Red Bank (N. J.) Div. He was formerly assistant director of sales and service for the Eclipse-Pioneer Div. at Teterboro, N. J.

**Henry Disston & Sons, Inc., Industrial Div.**—L. W. Jander has been appointed sales manager.

**Vickers Inc., Div. of the Sperry Corp.**—R. E. Esch has been appointed general sales manager.

**Beech Aircraft Corp.**—Mrs. Walter H. Beech, widow of the company's president, has been elected president and chief executive officer.

**Koppers Co., Inc.**—John W. Pennington, former staff engineer for the Caterpillar Tractor Co., has been named chief engineer of the Piston Ring Dept.

**Hydropress, Inc.**—The appointment of Alexander Zeitlin as vice-president was announced.

**United States Rubber Co.**—J. S. Johnson has been appointed assistant to the president of the company. He succeeds G. R. McNear, who has been elected a director and the managing director of the North British Rubber Co., Ltd., Edinburgh, Scotland, in which U. S. Rubber is a substantial stockholder.

**General Motors Corp.**—Harry J. Klingler, vice-president of the corporation and formerly general manager of the Pontiac Motor Div., was named a director and a member of the Operations Policy Committee, will become the group executive in charge of the passenger car and truck divisions. His successor as general manager of Pontiac will be Arnold Lenz, executive assistant to Mr. Klingler. Sherrod E. Skinner, vice-president of the corporation and formerly general manager of the Oldsmobile Div., will become the group executive in charge of the accessories divisions, succeeding F. L. Burke, who has been granted a leave of absence. Mr. Skinner's successor as general manager of Oldsmobile will be Jack F. Wolfram, chief engineer of Oldsmobile. Carl H. Kindl and Cyrus R. Osborn were elected directors and members of the Operations Policy Committee. Mr. Kindl is vice-president in charge of the Overseas and Canadian Group. Mr. Osborn is vice-president in charge of the Engine Group. Henry C. Alexander, a member of the Board of Directors, was elected to the Financial Policy Committee.

**Seiberling Rubber Co.**—John J. Walbeck has been appointed assistant advertising and merchandising manager.

**Kelsey Hayes Wheel Co.**—Roy C. Ingersoll, president of Borg-Warner Corp., Chicago, was elected a director.

**Stewart-Warner Corp.**—Leonard L. Robb has been appointed assistant to James S. Knowlson, president and board chairman of the company.

**Superior Steel Corp.**—P. W. Pheneger, assistant to the president, will also assume the direction and responsibilities of the Purchasing Dept., succeeding the late J. W. Schultz. John C. Zuk has been named assistant purchasing agent.

**The General Tire & Rubber Co.**—C. Dean Lampman has been appointed manager of sales promotion, succeeding A. Ray Carr, who was recently made manager of Kraft Service and Accessory Sales.

**Glenn L. Martin Co.**—A Design Development Dept. has been established in the Engineering Div. to be headed by G. S. Trimble, Jr., former chief of the Aerodynamics Dept.

**General Motors Corp.**—Louis C. Good has been elected to succeed M. E. Coyle (who has retired) as executive vice-president in charge of the car and truck group, body and assembly divisions group, and the accessory group.



**General Motors Corp.**—John F. Gordon has been elected a director and a member of the Administration and Operations Policy Committee, and he will succeed Mr. Good as group executive in charge of Fisher Body, Termstedt and the Buick-Oldsmobile-Pontiac Assembly Divisions.



**General Motors Corp.**—Charles A. Chayne was elected a vice-president of the corporation in charge of the engineering staff succeeding Mr. Gordon. Mr. Chayne was chief engineer of Buick.



**Nash-Kelvinator Corp.**—George Romney, vice-president, has been named a director of Kelvinator of Canada, Ltd.

**Ford Motor Co., Lincoln-Mercury Div.**—Raymond M. Lyons has been named industrial relations manager of the Lincoln Plant.

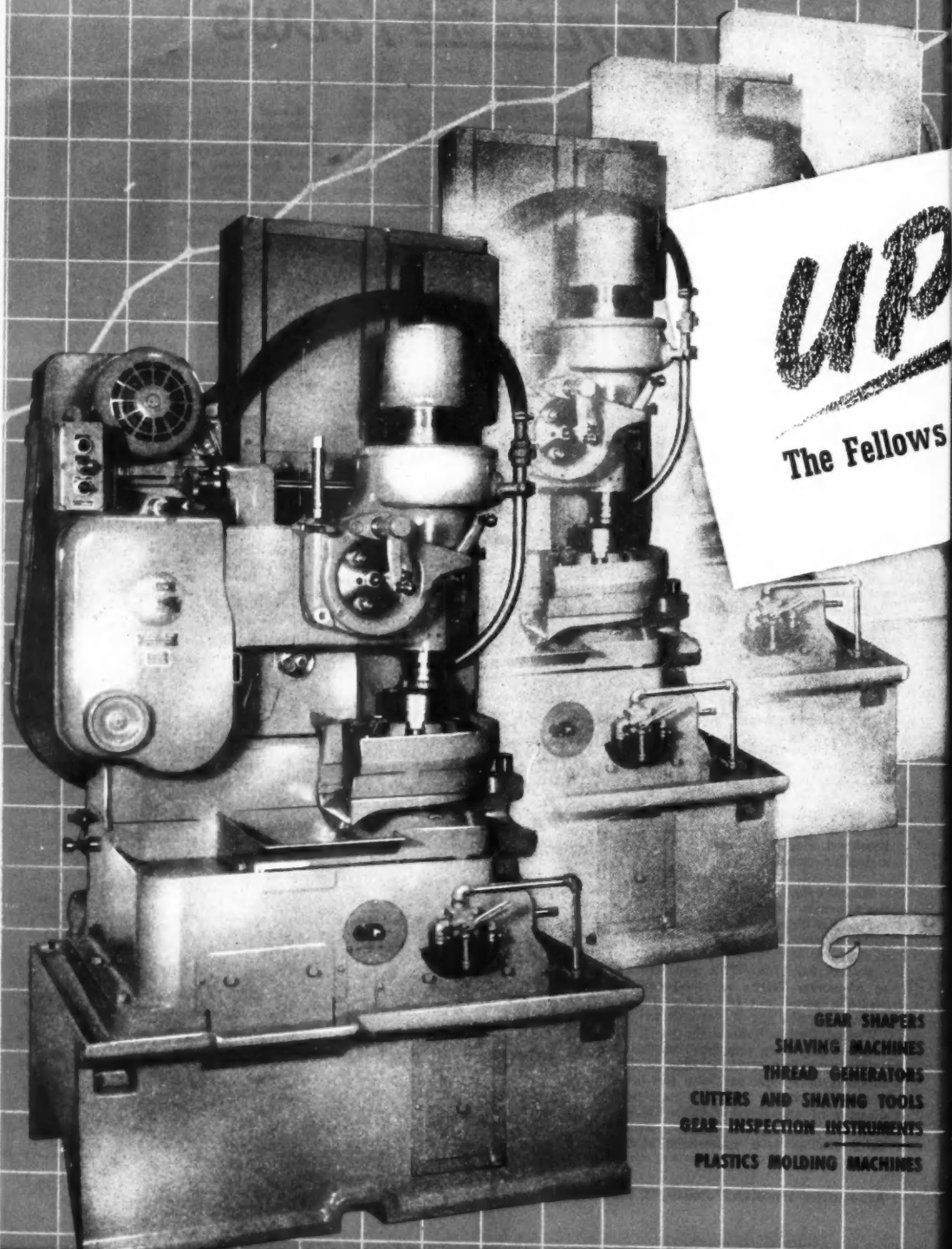
**The AP Parts Corp.**—B. W. Lang has been promoted from purchasing agent to vice-president; H. E. Bremford from assistant treasurer to treasurer; and A. J. Sawicki from traffic manager to plant superintendent.

**Niles-Bement-Pond Co.**—Clayton R. Burt, former president and former chairman of the board of the company, has retired from the presidency of the Potter & Johnston Co., Pawtucket, R. I., a wholly-owned subsidiary of the N-B-P Co. He was succeeded by Frederick U. Conard, president and general manager of Niles-Bement-Pond Co.

## Necrology

John Raymond Tapp, 47, president, Sun Electric Corp., died on Dec. 10, Chicago.

# GEAR PARTS TIME PRODUCTION SCHEDULE



**UP**  
The Fellows

GEAR SHAPERS  
SHAVING MACHINES  
THREAD GENERATORS  
CUTTERS AND SHAVING TOOLS  
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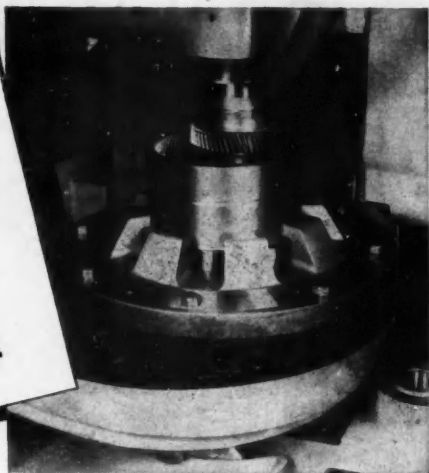






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sets a Production Pace for 1951**



*For an internal gear part an air-operated diaphragm-type chuck like this makes loading and unloading a simple operation—for stop-watch timing.*

- **AUTOMATIC  
QUICK-STOPPING  
OF CUTTER-SPINDLE  
RECIPROICATION**
- **AUTOMATIC POSITIONING  
OF CUTTER  
AT TOP OF STROKE  
(without coasting)**
- **AIR-OPERATED  
QUICK CLAMPING  
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Due to its amazing versatility, the 7A-Type Gear Shaper is able to compete with other production machines on a floor-to-floor time saving basis. High cutting speeds and precision control have always been there. To these advantages have been added speed-up of work handling, quick-acting work holding devices, etc.

The machines illustrated are set up to cut cast iron internal helical gears 27/32" face width, 16 pitch, 20° pressure angle, 79 teeth (5.1313" p.d.)—and to finish each gear in 2 cuts in 5 minutes floor-to-floor time.

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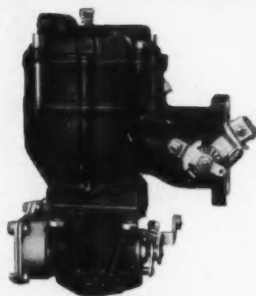
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and  
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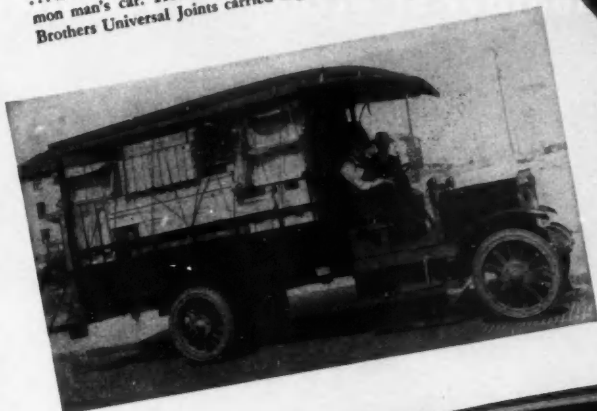
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Over the roughest terrain, they take grueling pulls, sharp speed changes and shock loads — and get the power through dependably.

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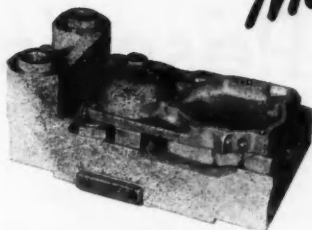


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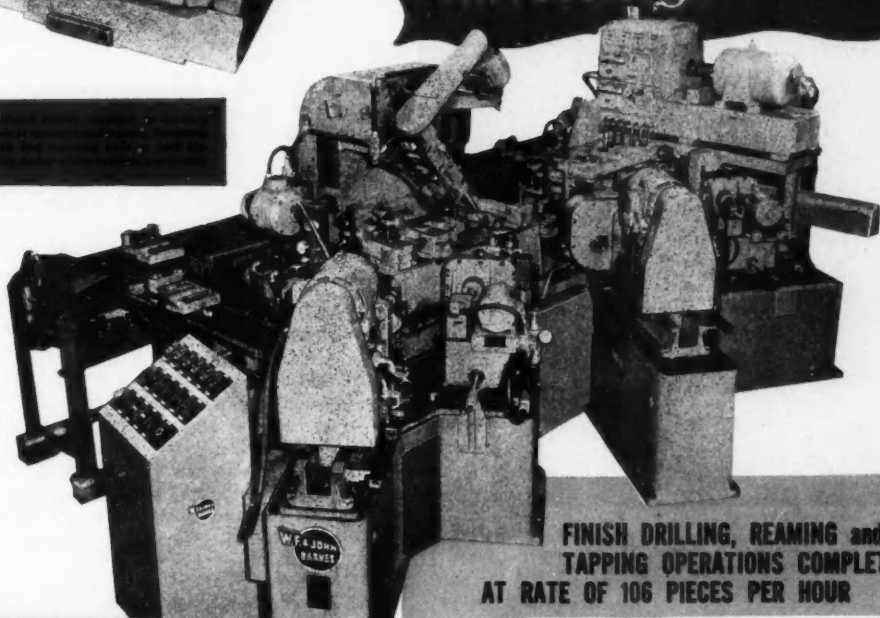
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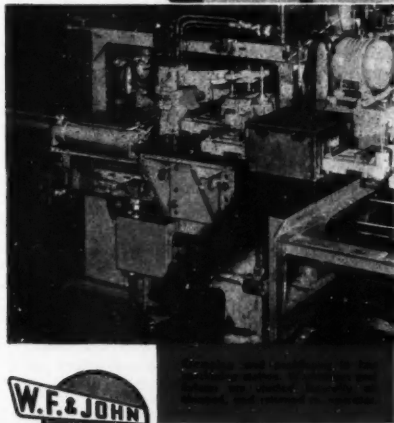


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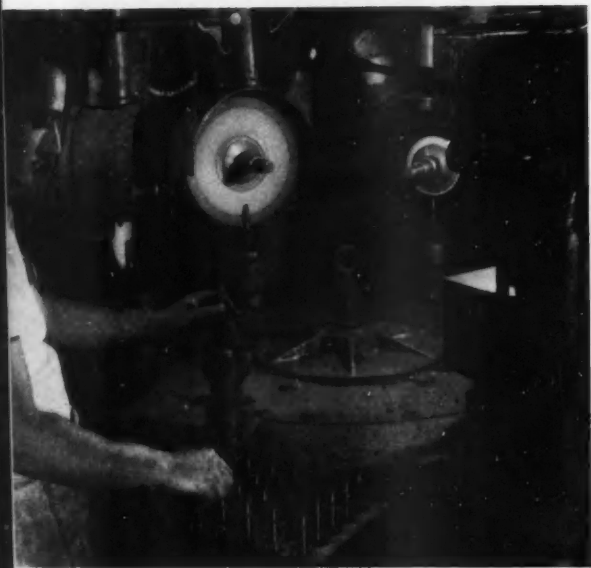


**W. F. and JOHN BARNES**

**312 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.**

## Flexible Production Setup at

# Pesco's



(Above) This is a close-up of the special automatic Hammond five-head polishing machine described in the text. The only function of the operator is to load and unload gears as shown.

REPRESENTING an investment of over \$3-million the Pesco Div., Borg-Warner Corp., is housed in a new plant outside of Cleveland having a main building floor area of 201,143 sq ft, including 142,400 sq ft of manufacturing area. The new site, boasting some 31 acres, also accommodates a separate boiler house and an isolated fuel laboratory, leaving plenty of space for future expansions.

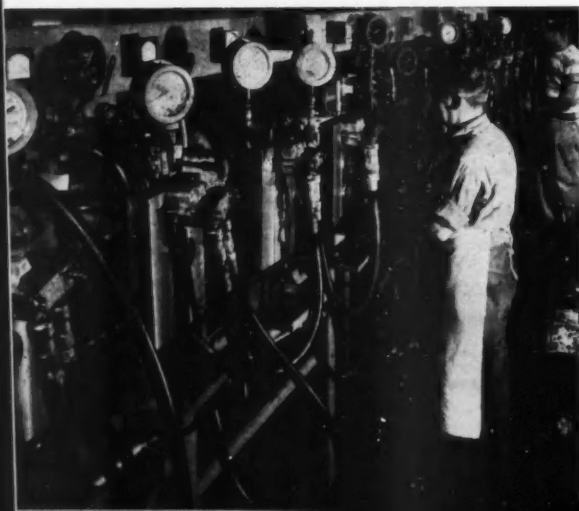
Since the end of the last war Pesco has done considerable work in the improvement of its extensive line of products, including the B-W supercharger, and has extended its scope to include hydraulic power packages for industrial applications. In its new home Pesco has the added advantage of well integrated laboratory facilities in metallurgy, chemistry, and research — including dynamometer equipment as well as altitude testing equipment — thus providing complete coordination of design, research, and manufacturing facilities under one roof.

Because of the variety of products and variations in them to suit the requirements of customers, the manufacturing operation relies almost entirely upon flexible, general purpose machinery capable of quick changeover from one part to another. Generally speaking, the only specialized departments are those intended for the production of d-c motors and the final testing equipment.

Since one of the major production activities is in the making of gears, they have an extensive gear department, hobbing most gears on Barber-Colman machines and some new Lees-Bradner multiple spindle hobbors. Fuel pump gears are of conventional spur involute type and are shaved on Red Ring gear shavers. Helical gears for superchargers are cut on Fellows gear shapers.

The outstanding example of a special single-purpose machine to be found here

(Below) Production testing of all pumps and accessories made at Pesco is a meticulous 100 per cent job. In this view may be seen some of the equipment for final testing of commercial fuel pumps.





# New Plant

By Joseph Geschelin

is the Hammond automatic buffer for finishing hydraulic pump gears for commercial and aircraft pumps. As illustrated, this is a five-head machine arranged for a completely automatic cycle. Its function is to finish the sides of gears as well as the journals. At the same time the buffing wheel is effective in breaking the sharp corners on the gear teeth. It is of interest that surface finish with this technique is held within four- to five-microinch.

Basically the Pesco line includes the following major products:

Hydraulic pumps—exclusive Pesco pressure loading principle.

Hydraulic motors.

D-c electric motors for specialized applications.

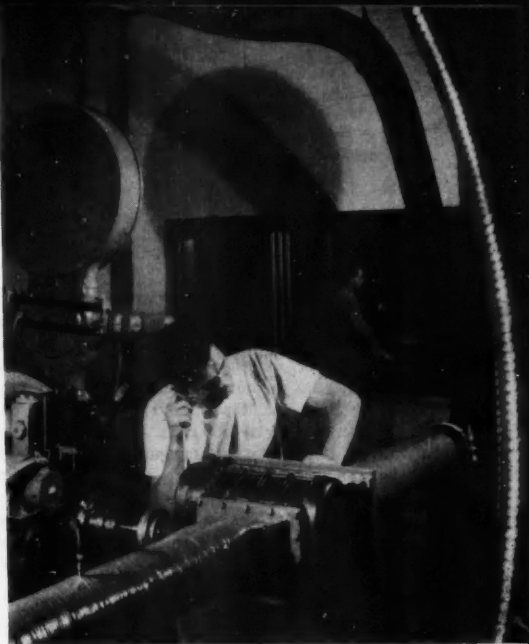
Aircraft accessories.

Flow equalizers—for dividing a single stream of hydraulic fluid into two or more streams to provide precisely equal movement of unequally loaded actuators.

B-W superchargers.

Hydraulic power packages for industrial tractors and lift trucks, farm tractors, agricultural machinery, bulldozers, dump trucks, snow plows, etc.

It is of interest that both the Pesco pump and B-W supercharger have undergone considerable refinement and improvement in design recently. Basic feature of the Pesco pump is "pressure loading," a patented principle

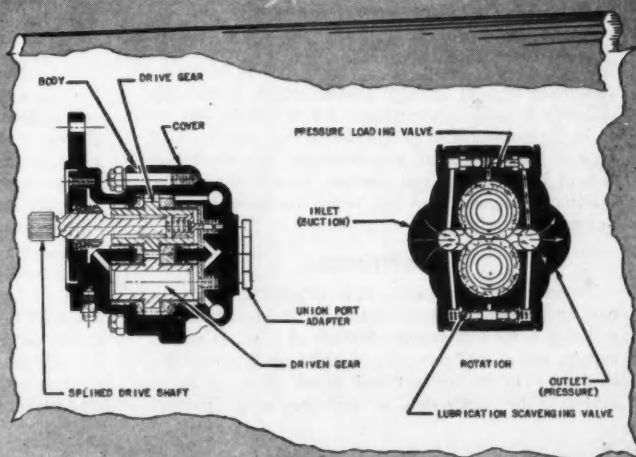


View in the research laboratory showing dynamometer testing of B-W superchargers.

which utilizes the pressure developed by the pump itself to maintain a minimum clearance between the bearings and gears. A channel drilled in the cover conducts fluid from the discharge port to the under side of the flange on the gear supporting bearings, forcing the bearings, which are mounted with a loose

(Turn to page 74, please)

Schematic drawing of a typical Pesco pump to show arrangement of parts and pressure loading principle.



# High Frequency Ignition

IT MAY come as some surprise to realize that the engines of modern automobiles are sparked by ignition equipment that has undergone no significant change in either external appearance or operating principle since its introduction some 35 or more years ago. While it is true that many improvements have been made in breaker points, coils, harness wiring and spark plugs, it is felt that conventional ignition systems have now been pushed to the limits of their operating performance without fully satisfying the requirements of modern engines. As a consequence, this article is devoted to the introduction of a high-

system meeting these practical requirements. It is distinctive in that it requires no timing breaker points or cam, and produces a spark discharge that is high-frequency in character. The system comprises three working parts; a power supply, a discharge capacitor and a distributor-transformer unit. High voltage direct current is produced from the battery source by the vibrator power supply. The discharge capacitor provides the energy discharge required to produce a spark at the spark plug electric discharge surfaces. The distributor-transformer unit houses a high-frequency transformer which rotates with the engine distributor shaft. Both high and low voltage windings of this transformer terminate on distributor fingers. Grounded electrodes, as part of the distributor housing, cooperate with the primary (low voltage) finger. They are equal in number to the engine cylinders and spaced in the correct firing sequence. The secondary (high voltage) distributor finger is positioned for alignment with a high voltage electrode synchronously with the primary finger.

This high-frequency ignition system produces the high voltage for firing spark plugs in two steps. While the transformer distributors rotate between electrodes, the power supply acts to charge the discharge capacitor to approximately 3500 volts. When the primary finger approaches an electrode, which is maintained with close radial clearance to the rotating finger, the capacitor discharges through the primary coil of the transformer by sparking across the primary distributor air gap. The resulting high rate of current change through the primary produces

the magnetic flux required to induce a high voltage in the secondary coil. The secondary distributor finger routes this high voltage impulse to the proper spark plug. It should be emphasized that the capacitor discharge into a very low electrical impedance circuit is the principle which characterizes the spark of this high-frequency type of ignition.

The voltage available from a high-frequency system is practically invariant with engine speed. This is possible because the response of the power supply is designed to be sufficiently fast over a wide range of speeds to completely charge the discharge capacitor between successive spark discharges. Thus each spark receives practically the same energy regardless of engine speed, this energy varying only with the power

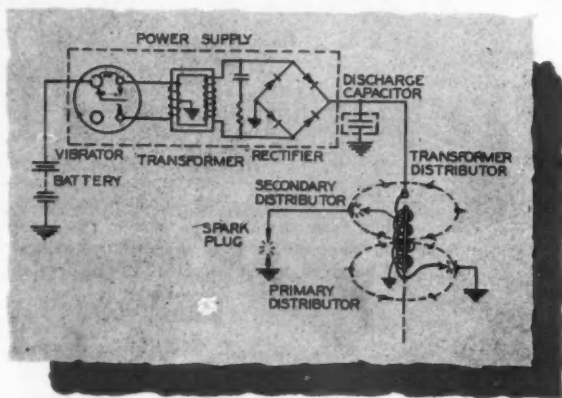


Fig. 1 High-frequency ignition system (six cyl)

frequency type of ignition system which is basically different from the conventional, but sufficiently similar to be interchangeable with existing equipment. This type of ignition system was developed with the intention of bridging the gap between present automotive ignition equipment and the requirements of modern automotive engines.

## High-Frequency

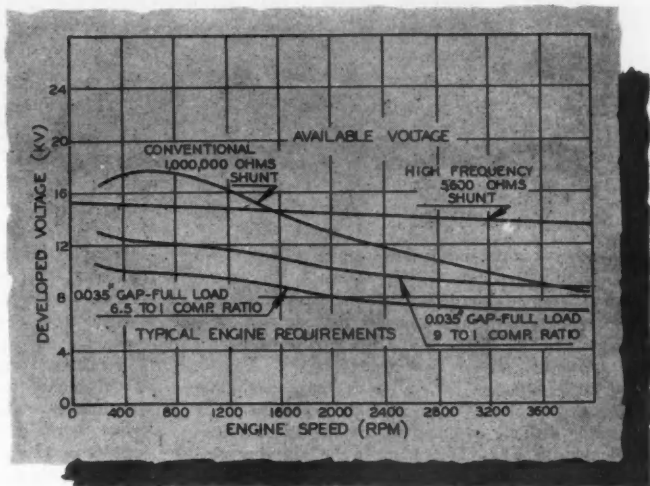
To be practically useful, it is recognized that any new automotive ignition system must be capable of utilizing a six volt storage battery as a prime power supply, and also of providing a jump spark across the electrodes of a conventional spark plug. Fig. 1 schematically represents a high-frequency ignition

# Needs No Breaker Points

By  
Donald C.  
Peroutky

General Electric Co.

Fig. 3 Typical curves of available voltages across given fouling conditions versus engine speed. Input volts, seven. Secondary capacity, 50 mmfd.



supply voltage regulation. As shown in Fig. 2, voltage reserve for a high-frequency is adequate over the entire range of engine speeds.

## Critical Speed - Voltage

**Points**—Ignition systems in general are designed for operation over a definite engine speed range. The critical points are the speeds, in either the high or low regions, beyond which operation cannot be considered reliable.

A high-frequency system of the type being considered has no low speed critical point, as maximum voltage is available at practically zero engine speed. High speed critical is determined primarily by the

prime frequency of the power supply vibrator. Commercially available vibrators place this point well above even the extreme speeds attained by racing engines.

**Spark Discharge Frequency**—The circuit characteristics of the high-frequency system are sufficiently small to permit the discharge of capacitive energy at a high rate, with the resulting current oscillations capable of sparking badly fouled plugs. Normal voltage is available with leakage resistances as low as 5000 ohms. Typical curves of available voltages

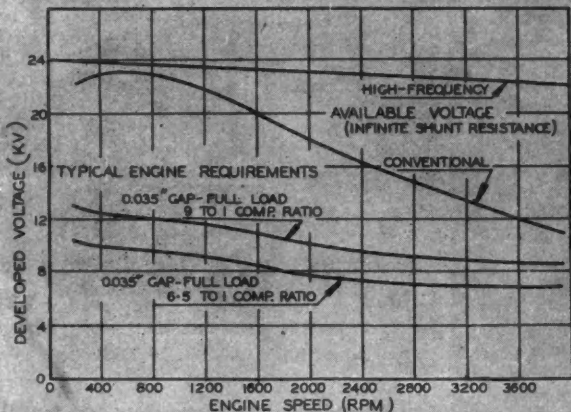


Fig. 2 Speed-voltage characteristics. Input volts, seven. Secondary capacity, 50 mmfd.



## High Frequency Ignition

Fig. 4 Components of a high-frequency ignition system, showing from left to right the discharge capacitor, transformer-distributor unit, and power supply.

across given fouling conditions versus engine speed for both ignition system types is shown in Fig. 3.

**Spark Energy**—One of the factors determining effective spark plug life is the electrode erosion rate, which in turn is a function of the electrical energy in the spark discharge.

The high-frequency system spark has a negligible inductive component, and measurements indicate that it contains as little as one-fifth the energy of a conventional spark. These facts point to the logical conclusion that spark plug electrode erosion rates will be materially less than the erosion rates encountered with conventional ignition.

**Timing Permanence**—In a high-frequency ignition system, which has no timing breaker points, timing is governed by the positioning of the primary ground electrodes in a steel ring and remains unchanged for the life of the apparatus. Erosion of the electrodes can cause a slight shift in timing in the retard direction, but proper choice of electrode material can make this erosion negligibly small.

**Cold Weather Starting**—Automotive engines require a spark to start at a point in the cranking cycle which demands the largest starting motor current load from the battery, that is near the end of the compression stroke. At this point, available ignition coil output voltage from a conventional ignition system is necessarily low due to low battery input voltage, thus resulting in poor ignition performance.

A high-frequency ignition system, on the other hand, has an advantage in that spark energy is stored on the discharge capacitor before a spark is required in the cylinder. This energy storage can occur during that part of the cranking cycle at which battery voltage is relatively high, and remain on the capacitor during low battery voltage periods until a spark is required at a spark plug.

**Output Voltage Availability**—The general trend in modern engine design is toward higher compression ratios, cleaner intake manifold designs and greater

spark plug electrode spacings, all of which require increases in spark plug voltage requirements beyond present day levels. For adequate voltage reserves, ignition systems are being required to develop greater maximum outputs to spark these engines. Such requirements are stringent in view of the fact that the magnitude of the output voltage available from an ignition system is directly related to the nature of the prime source of energy, which on present day automobiles is the six volt storage battery. To change this battery voltage to a higher level would be a major undertaking in the light of service and replacement parts problems.

The conventional ignition system is rapidly reaching its voltage availability limit with a six volt storage battery source. Improvements in coil design and the

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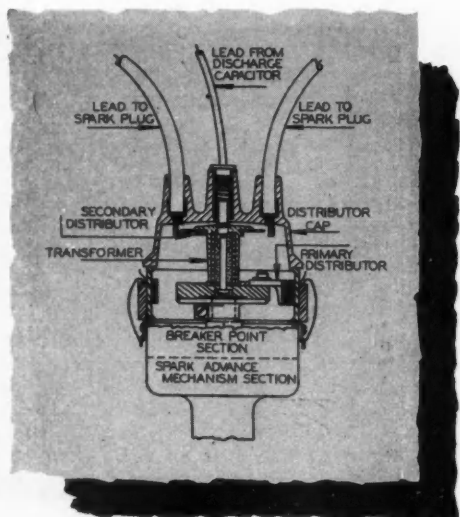
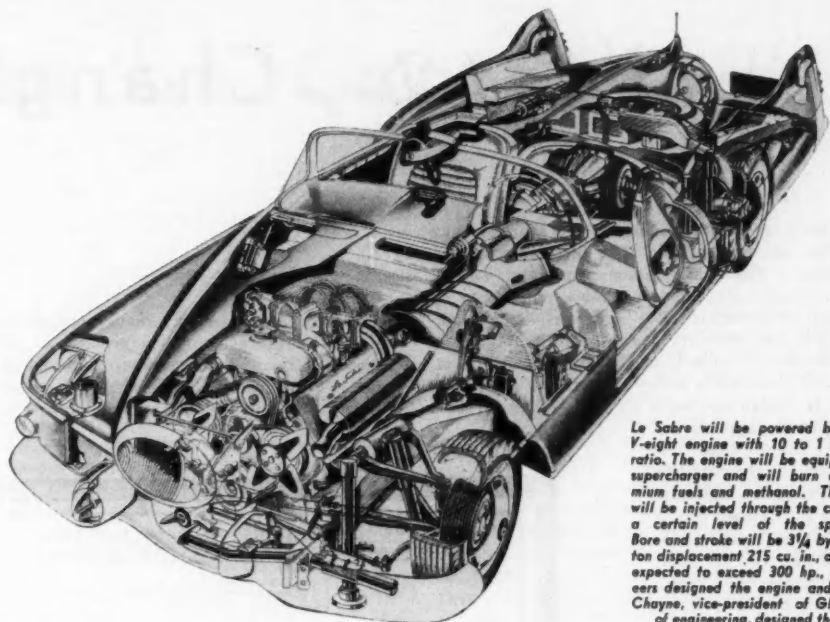


Fig. 5 High-frequency transformer-distributor unit.



*Le Sabre will be powered by a special V-eight engine with 10 to 1 compression ratio. The engine will be equipped with a supercharger and will burn current premium fuels and methanol. The methanol will be injected through the carburetor at a certain level of the speed range. Bore and stroke will be  $3\frac{1}{4}$  by  $3\frac{1}{4}$  in., piston displacement 215 cu. in., and output is expected to exceed 300 hp., Buick engineers designed the engine and Charles A. Chayne, vice-president of GM in charge of engineering, designed the chassis.*

## Le Sabre Designed for the Future

**G**ENERAL MOTORS' new experimental car Le Sabre, a custom built two seater which has been in development four years, is expected to be completed within two months according to an announcement by Harley J. Earl, GM vice-president in charge of styling. It has just been unveiled in the form of a full-size plaster model. Le Sabre is purely experimental and is the car of the future only to the extent that some of its features may appear some day in standard automobiles.

*(Above) Two 20-gal aircraft type fuel tanks, one for gasoline and the other for methanol, are housed in the twin tail fins. Rear wheels are independently suspended, leaving the differential stationary, and a special Dyna-flow torque converter is located just ahead of the differential. Total weight of the car is expected to be approximately 3000 lb. Wheelbase is 115 in. and overall length is 200 in.*

*(Right) The top section of the front grille is part of the lighting system. When the front lamps are turned on, the grille revolves out of sight and a pair of close set headlights, fitted to the reverse side of the grille, swings into place.*

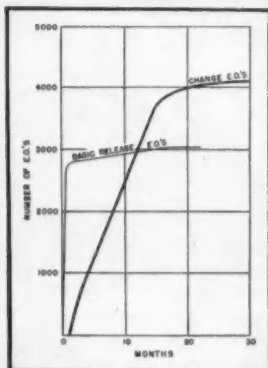


# How Aircraft Design Changes

PERHAPS in no other industry are changes more vital, and more prolific, than in the aircraft industry. There are reasons for this; technological advances are rapid—airplanes must keep up with them or become obsolete before delivery; changing tactical requirements demand fluidity of design and production in order to meet them promptly; complexity and time limits make it practically impossible initially to design and build all parts of an airplane so they work perfectly not only the first time but throughout its rigorous life.

Thus one of the important problems in the operation of a successful aircraft plant is that of being able to incorporate changes into production airplanes as rapidly as may be required. But while the incorporation of changes into production is important, there are other important and usually conflicting requirements that must also be met; these are the necessities of delivering on schedule and maintaining competitive and profitable costs.

Fig. 1—Change engineering orders released for one production airplane model.



The incorporation of any change into production airplanes therefore becomes a problem of compromises whose optimum solution requires a careful study of facts and the exercise of considerable judgment.

The size of the job of handling changes in a typical

## THE ENGINEERING RELEASE SYSTEM FOR ENGINEERING ORDERS (E.O.'S) & DRAWINGS

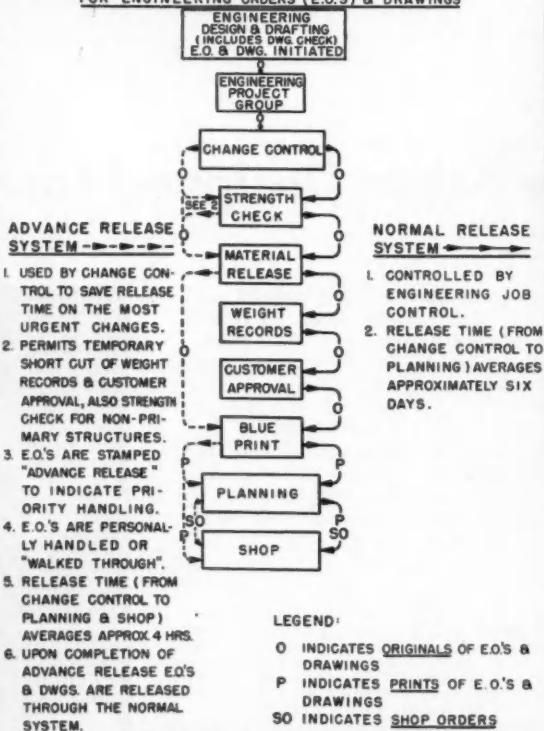


Fig. 2—The engineering release system



# Can be Controlled

By E. F. Stoner

Supervisor  
Change Control Dept.  
Douglas El Segundo Plant

aircraft plant may be indicated by the number of changes released against one model of production airplane, as shown in Fig. 1. And since there are usually several models and their versions in production simultaneously it is apparent that the handling of changes can be sizable.

## The Change Control Department

At the Douglas El Segundo Plant the fitting of changes into the production picture is vested in the Change Control Department. Stated briefly, this department's responsibility is to arrange for the incorporation of changes into the production of airplanes at the proper effectivity point, by the most economical methods possible, with minimum disruption of production and with no delay in deliveries. Change Control operates administratively independent of Engineering, Manufacturing, and Sales, but functionally as a part of the Engineering Release system, as shown in Fig. 2. By being the first step in the Engineering Release system, Change Control is assured of receiving all Engineering Orders (E. O.'s) authorizing changes to production airplanes at the earliest possible time.

The Change Control Department is comprised of groups of change analysts, each group being responsible for a production model and all its versions. Each group is headed by a group administrator. The entire department is assisted by a competent staff.

## Change Control Activity Starts Early

At El Segundo the Change Control Department accepts a high degree of responsibility for and interest in the accomplishment of all changes, from the time of their conception to their incorporation in production. It behooves all concerned with a change to expedite its progress, since the cost of incorporating a change on the early airplanes affected increases rapidly as the length of time remaining to do so decreases beyond the point of normal fabrication and installation. This is illustrated in Fig. 3.

In order to learn of changes as early as possible, copies of all correspondence relative to changes are routed to Change Control, weekly meetings are held with the Project Groups, and close daily liaison is

maintained with the Design and Project Groups. Upon learning of a potential change a follow-up record known as a Change Log is initiated. This provides a reference for all information pertinent to the change, and a record of activity relative to it. The act of maintaining this record makes it possible for Change Control to acquire a complete background of the change, and to do advance planning for it. In many cases at this stage Change Control can assist Engineering by advising them of the required release schedule, the problems to be met in incorporating the change in production, the number of airplanes which will require rework and the status of parts, since all these factors may have their effect on the change design. Engineering cooperates fully by providing

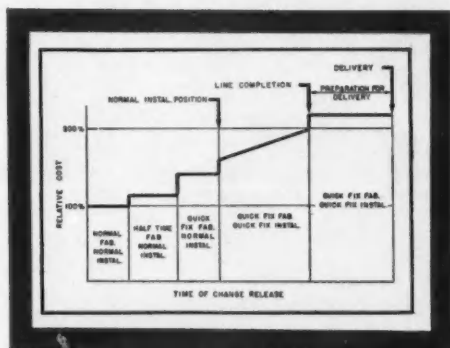


Fig. 3—Cost of incorporating changes as a function of the length of time available.

rework-type designs in addition to production designs if indicated by this analysis of the manufacturing problems.

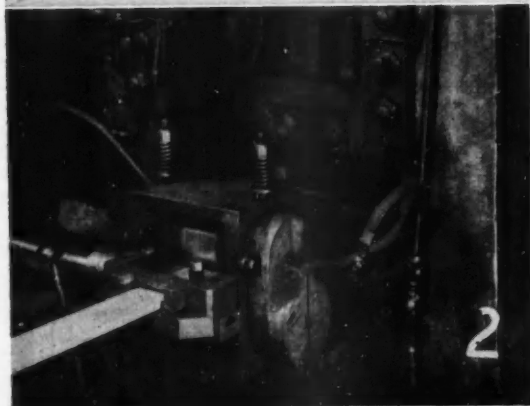
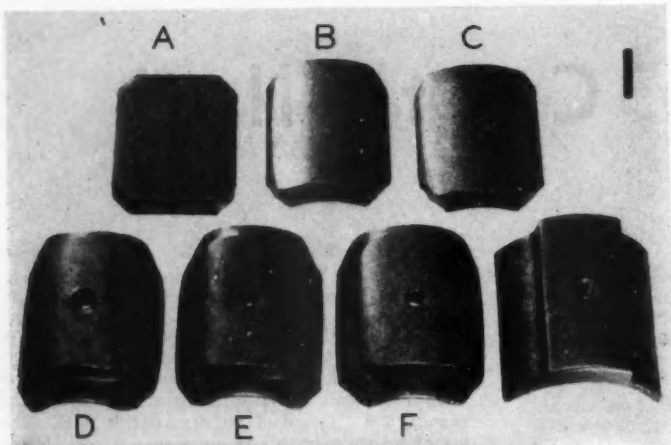
## Change Numbers are Issued

If the change is involved and will affect several drawings and parts, and will require coordination and follow-up to insure proper accomplishment, it is identified by a change number. All E.O.'s bear the change number with which they are associated. Thus, even though Engineering releases are not all made simultaneously as a "Package," the individual releases can be properly associated with the correct change and hence scheduled and followed properly.

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# Swaged

By  
Herbert  
Chase



**O**UTSTANDINGLY new and important from economy and other standpoints is the development of swaged pole shoes produced by the Delco-Remy Division, General

Motors Corp., for use in automotive generators of the same make. Processing is unique and results in several important advantages, including either a substantial saving in copper wire for field coils or, if the same weight of wire is employed, an increase in generator output of more than twenty per cent.

Formerly, pole shoes were made by conventional methods from special rolled stock cut into lengths as shown at lower right in Fig. 1. This same illustration shows the new shoes as they appear in successive stages of production from the blank A, top left, to finished piece, F. Shoes produced by the new method weigh and cost about the same as those employed formerly but, in addition to effecting significant economies in copper wire for coils because of the rounded corners of the pole core over which the coil fits, yield other benefits.

Square corners of old style shoes were not only unfavorable in respect to the extra copper wire needed but coils had to be cut-

Fig. 1—Delco-Remy generator pole shoes as formerly produced from special rolled stock, lower right, and as now fabricated from the blank A, top left, in steps B, C, D, E and F.

Fig. 2—Blanks are cut off from hot rolled strip stock roll fed to this press, which runs continuously. Shearing not only severs the blanks at the rate of 40 a minute, but, at the same time, cuts off corners at a 45-deg angle.

Fig. 3—Washed blanks from chute at left are fed to the dies in this press by an automatic slide hand loaded through a hole in the plate below the operator's right hand. The die bends each blank to the prescribed arc.

## Generator Pole Shoes

# Conserve Copper Wire

ton taped to resist abrasion at corners. Insulation is now applied by dipcoating in ethyl acetate at lower cost at the same time reducing the chance of insulation failures. Moreover the coil is shorter, end to end, hence it projects less beyond shoe ends. This increases clearance with end frames from 1/32 in. before to 9/16 in. now, thereby substantially decreasing the chance of damage in assembly resulting in rejects. Finally, magnetic hum is reduced, resulting in quieter operation.

About the time that production of the new shoes had been developed, some customers changed specifications to provide for increasing generator output from 33 amp to 40 amp. To obtain this increase, field coils were wound to include the same weight of copper wire required in the old type of shoe but the coils were made to fit the new shoes. This provided coils of smaller overall dimensions than before but upped the ampere-turns to yield the higher output demanded. Hence, for the greater output, the dimensions of generators remained unchanged and corresponding cost economies resulted.

Production of the new shoes has involved, of course, radical changes in fabricating methods and equipment as well as in using a standard oblong section of hot rolled SAE 1008 steel strip stock instead of the special

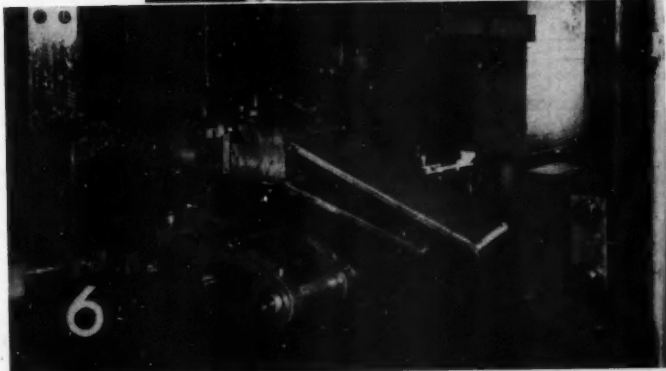
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Fig. 4—Formed blanks placed in two magazines shown here are fed to this press two at a time. Punches and dies used produce and countersink a hole at the center of each workpiece.

Fig. 5—Front view of the setup in one of the two hydraulic presses that swage a flange and leave an oblong boss with well rounded corners on each piece fed by the hand loaded slide. The resulting product is shown at D, Fig. 1.

Fig. 6—Rear view of one swaging die and the slide that feeds it. Also shown is a part of the automatic positioning stop that is retracted as the dies are closed. After swaging, parts are ejected and fall on a conveyor.



# Two New Gear

By C. M. Schwitter

Development and Research Division  
International Nickel Co., Inc.

**T**HE purpose of this article is to focus attention on two materials hitherto not commonly employed for gears and to present a discussion of their characteristics.

The first of these two materials is an alloy steel generally manufactured to the chemical limits of Table 1. It is simply a rather heavily alloyed version of the familiar 4340 type, with no unusual features except the presence of about 1.25 per cent aluminum. It is commonly called Nitalloy N, was developed some years ago as a nitriding steel with certain specific virtues, and has been accepted as such for quite some time. When suitably treated it develops a nitrided surface which is tougher than that of other steels commonly employed for nitriding, although not quite so hard. It also develops a stronger core than is obtainable in any of the other nitriding steels. However, in this discussion I wish to present the material simply as an alloy steel which, because of certain precipitation-hardening characteristics, can be attractive as a gear material under certain circumstances.

The carbon content is rather low compared to most gear steels used in the quenched and tempered condition. Its alloy content is high, and these operate to produce end quench hardenability characteristics of the kind illustrated by Fig. 1. Hardness at the quenched end is established by the relatively low carbon content; this hardness does not drop very much

Table 1

Customary Chemical Limits  
for Nitalloy N

Carbon	0.20-0.27
Manganese	0.40-0.70
Nickel	3.25-3.75
Chromium	1.00-1.30
Molybdenum	0.20-0.30
Aluminum	1.10-1.40

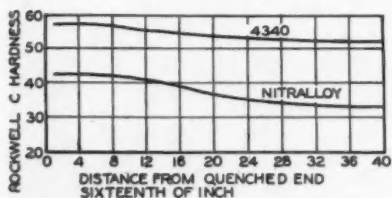


Fig. 1—End quench hardenability curves for Nitalloy N and 4340 steel.

as the severity of quench is decreased because of the high alloy content, which produces a deep hardening steel not unlike the 4340 type with which it is compared. Such a steel can be expected to respond well to liquid quenching in heavy sections, or to air quenching in small or medium sizes.

The mechanical properties of Nitalloy N in the quenched and tempered condition parallel those of 4340 and it may be annealed for maximum machinability without presenting any special problems. Two procedures are recommended, both involving austenitizing at 1500-1550 F. Isothermal transformation may then be accomplished by cooling and holding eight hours at 1225 F followed by furnace cooling to 1150 F, then cooling to room temperature in air. If preferred, continuous cool transformation may be practiced, in which case austenitizing should be followed by cooling to 1300 F at any convenient rate, after which the rate should approximate 20 F per hour until the steel has reached 1150 F, after which it should be finally cooled in air. Both cycles yield a hardness of about 217 Brinell and a structure consisting of ferrite and fine carbide spheroids with some pearlite. In no instance should the steel be cooled slowly below 1150 F because it will precipitation harden.

# Materials

It is this precipitation hardening characteristic which is unique and with which we are concerned. It may be illustrated by the data of Table 2. The properties in the left-hand column were developed by conventional oil quenching from 1650 F followed by tempering at 1200 F. The results are about what would be expected of any suitable alloy steel so treated. When an aging treatment is applied, however, yield and tensile strength are sharply increased and Brinell hardness raised to

**Table 2**

**Tensile Properties  
of Nitralloy N, Before  
and After Aging**

	Before Aging	After Aging
Tensile strength, lb/sq in.	132,400	190,250
Yield point, lb/sq in.	114,600	180,000
Elongation, per cent in 2 in.	22	15
Reduction of area, per cent	59	43
Brinell hardness	277	415

**Table 3**

**Progress of Precipitation  
Hardening in Nitralloy N**

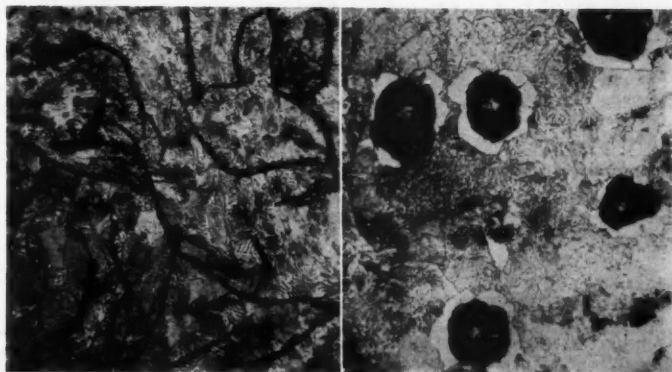
Aging Period at 975 F	Rockwell C Hardness no change (29)
2 hours	32
4 hours	35
6 hours	40
8 hours	41
10 hours	41
12 hours	42
14 hours	42
16 hours	42

415. Elongation and reduction of area decrease in the proportion expected of such a rise in strength.

The steel can be quenched and tempered—or normalized and tempered if preferred—to develop a structure which can be quite reasonably machined. The finish-machined part can then be aged to produce fairly high strength without any risk of the distortion which normally follows conventional heat treatment.

The aging treatment given to produce the properties shown in Table 2 comprised a 48 hour treatment at 975 F. It was, in fact, a simple nitriding or pseudo-nitriding cycle. When we ignore any necessity for producing a nitrided case, this cycle can be considerably shortened. Table 3 follows the aging cycle by means of Rockwell hardness tests on one in. diameter bars oil quenched from 1650 F and tempered at 1275 F for one hour to develop an initial base hardness of

**Fig. 2—Gray iron—flake  
graphite, and ductile iron  
—spheroidal graphite.  
Magnification X250.**





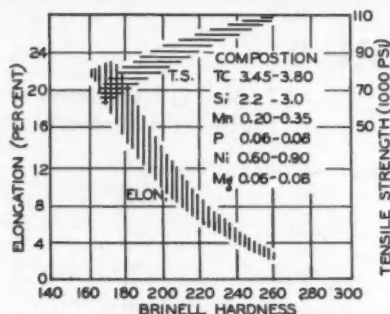


Fig. 3—Relationship between elongation, tensile strength and hardness of ductile cast iron in one-in. sections as-cast.

C 29. It can be seen that 14 hours is sufficient time to reach the peak of 42 Rockwell C, and if a goal of 40 is satisfactory, an eight hour treatment is enough to produce the result.

The highest practical hardness which can be developed by precipitation hardening is in the range Rockwell C 42-44. Higher aging temperatures permit the use of shorter times, but the ultimate hardness is not quite as high. Lower aging temperatures call for impractically long soaking periods. Increasing the starting hardness by lowering the initial tempering

Table 4

Charpy Impact Values (Keyhole Notch) of Nitalloy N and Quenched and Tempered 4340

Steel	Aging temp. deg F	Charpy Impact ft lb*	BHN
Nitalloy N	975	12	395
Nitalloy N	1000	18.5	384
Nitalloy N	1025	20.5	377
Steel 4340	....	23.5	385

\* Average of three to five tests.

temperature does not help.

Among the objections to preliminary treatments other than quenching and tempering, is the fact that

impact properties suffer appreciably. Table 4 presents a study of impact properties of Nitalloy N given the best preliminary treatment available, namely oil quenching at 1650 F followed by tempering at 1200 F to produce a hardness of 263 Brinell. Comparisons are made with 4340 steel as a base. When the standard aging treatment of 975 F is employed, impact values of about 12 ft lb are obtained, rather inferior to 4340 at slightly higher hardness. When this hardness differential is wiped out by raising the aging temperature to 1000 F much improvement results for Nitalloy N, but it remains inferior to 4340 even when aged at 1025 F to produce 377 Brinell. When resistance to impact is an important consideration, it is obviously advantageous to raise the aging temperature to 1000-1025 F.

Likewise, Nitalloy N appears to be notch sensitive in respect to its endurance limit. However, the unnotched endurance limit of Nitalloy N does not compare too unfavorably to 4340 when allowance is made for the lower hardness and hence lower strength of the Nitalloy; notch sensitivity is high however, being about 3 compared to 2.5 for 4340. It should be borne in mind that this comparison is deliberately harsh, since 4340 is a steel which has a reputation of being one of the best heavy duty materials available, with excellent notch toughness at high strength levels.

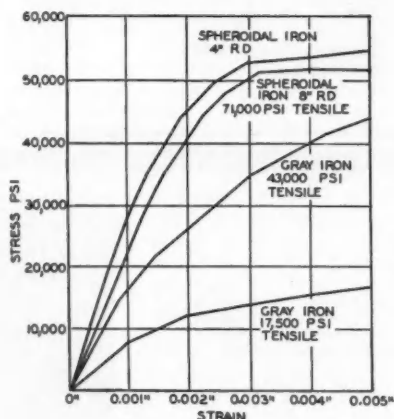


Fig. 4—Stress-strain curves of ductile iron in comparison with those of cast gray cast iron.

## Gear Materials

Table 5

Proposed Minimum Mechanical Requirements for Ductile Iron

Grade	Tensile strength, psi	Yield strength, psi	Elong. per cent	Brinell hardness
90-85-02	90,000	65,000	2.0	225-265
80-60-05	80,000	60,000	5.0	195-225
60-45-15	60,000	45,000	15.0	140-180
80-60-00	80,000	60,000	....	230-290

The steel reacts to quenching and tempering as does any heavily alloyed steel. Its distortion characteristics in this respect are not unique and final machin-

Table 6

Notched and Unnotched Endurance Limit—0.050 In. Notch

Material	Tensile Properties			Endurance Limit*	
	T.S. psi	Y.S. psi	Hardness BHN	Unnotched psi	Notched psi
Forged steel	80,100	44,600	...	35,000	17,800
M-50 Meehanite	48,800	...	218	16,000	13,000
Ductile cast iron	71,500	51,200	170	24,000	18,500

\* Rotating beam endurance tests using one in. diam specimens. Notch of 0.05 in. radius on notched specimens.

ing should be completed only after this preliminary cycle. The distortion resulting from the precipitation hardening treatment is practically negligible. When a nitrided case is produced, an allowance of about .001 in. per in. is made. This dimensional change, which incidentally is quite uniform, is nearly entirely due to the absorption of nitrogen by the surface layers. In the absence of nitrogen, the change in dimension is negligible.

With the foregoing data in mind, it is possible to outline suggested manu-

facturing cycles for Nitralloy N gears. The essence of this cycle involves a preliminary oil quench and temper, after which the gear may be finish machined from the forged blank, and following which the aging

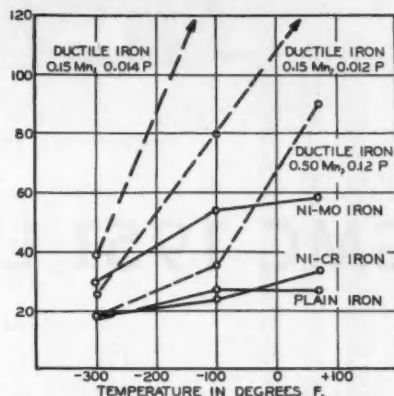


Fig. 5—Arbitration bar impact properties at low temperatures.

cycle may be given. The gear is then finished and possesses its best combination of properties. If exceptional dimensional precision is desired it may be advantageous only to rough machine after the preliminary quench and temper, then interpose a stress-relieving treatment at 1200 F followed by finish machining and aging.

Sometimes a prior normalizing treatment at 1750 F is useful to promote homogeneity. This is true of (Turn to page 82, please)

Table 7

Wear Tests on Ductile Iron

Specimen No.	Heat No. 1	Heat No. 2				Heat No. 3
	1	2	3	4	5	
Specimen wear (mg)	10.9	7.2	7.3	6.2	9.8	
Drum wear (mg)	82.1	89.0	87.3	101.0	68.3	
Total wear	73.0	96.2	94.6	107.2	78.1	



Three-quarter view of 1951 GMC model 350 having new CV window in cab.

# GMC 1951 Light Duty Trucks

By Joseph Geschelin

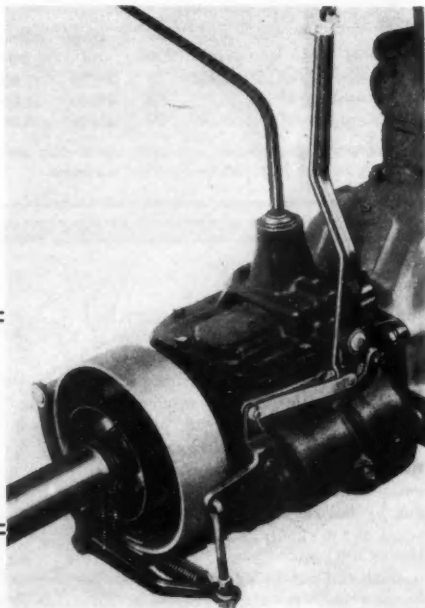
**I**NITIAL announcement of 1951 models by GMC Truck & Coach Div., General Motors Corp., covers the introduction of light duty models ranging from 4800 to 16,000 lb GVW; and 22,000 to 26,000 lb GCW. It is of interest that the new model designations shown on the table replace the corresponding model designations used heretofore—from FC-100 to FF-350, the latter being a C-O-E model. This is in keeping with a newly adopted sales policy designed to simplify the selection of vehicles suited to the requirements of individual users.

The new model designations indicate the basic chassis in terms of progression of gross ratings, while the figures at the right designate the engine supplied as standard equipment for each model. Thus in the case of light duty models described here, the numerals "22" indicate the "228" engine, while "24" indicates the "248" engine.

Some important mechanical changes have been

effected on these new models. In the first place, maximum output has been increased by four bhp on both the "228" and "248" engines. Thus the "228" now is rated 100 bhp at 3400 rpm; while the "248" has  
(Turn to page 67, please)

New GMC transmission brake.



## 1951 GMC Light Duty Models

Models	1951 New		Models	1951 New	
	GVW	GCW		GVW	GCW
100-22	4,800*		280-22	11,000	
150-22	5,800		300-24	14,000	22,000
P150-22	7,000		3300-24	14,500	
250-22	8,800		350-24	16,000	26,000
			F350-24	16,000	26,000

\* Only Change in Rating.

# Automatic Transmission Patent Suits to Go to Trial

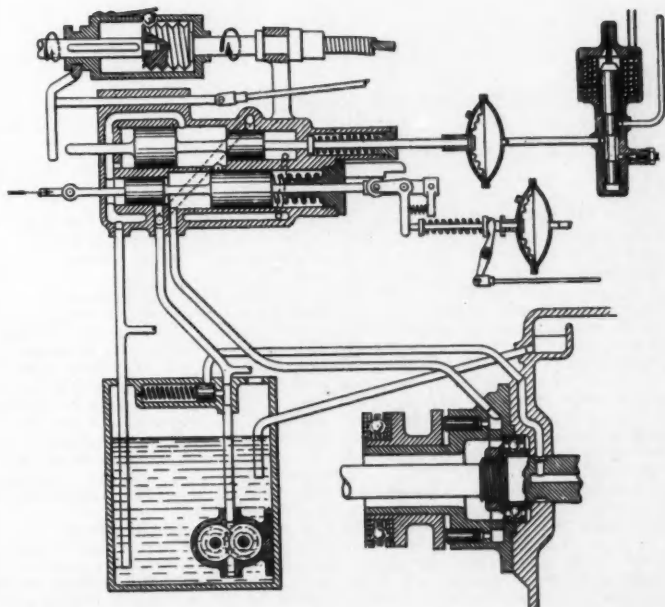
Manufacturers  
Intervene  
for Dealers

By James R. Custer

**P**ATENT litigation involving current automatic transmissions and other self shifting mechanisms, which may result in long court battles, will get under way this month with the first trial in the United States District Court of Maryland at Baltimore. Civil action suits have been filed in Baltimore claiming infringements in the Packard Ultramatic, General Motors Hydra-Matic, Packard Electromatic clutch, Packard overdrive, and the Hudson Vacumotive and Drive-Master units. The Packard Electromatic clutch was discontinued in 1950.

The plaintiff and owner of the patents in each case is the Specialty Equipment and Machinery Corp., a Maryland corporation with headquarters in New York City. This company, which is being represented by Moore and Hall, Washington patent attorneys, is reported to be engaged in developing machines for spot welding aluminum and metal bending equipment. Maurice Partiot is its president.

The first suit is scheduled to go to trial Jan. 15 before Chief Judge William C. Coleman of the Maryland Federal District Court and is against the Zell Motor Car Co. of Baltimore. Civil action was started several months ago and since the Ultramatic transmission is the basis of this suit, Packard Motor Car Co. intervened in the case as a co-defendant. Originally the Packard Electromatic clutch and overdrive were included in this civil action, which involves designs of the Bendix Aviation Corp. and Borg-Warner Corp., but separation from this case was granted at the request of these two companies. (Turn to page 100, please)



Fleischel patent sketch showing application of valves with different size pistons to automatically change clutch of a transmission. In lower left is shown an oil reservoir with pump and at the lower right a servo-motor for operating a clutch.

# New Governor for Wide Range of Engines

Of interest to industrial engine builders and producers of industrial power plants and tractors is the announcement of a new mechanical governor by Hoof Products Co., Chicago 38, Ill. Although designed to provide extremely close regulation regardless of load conditions, it is unique in permitting adjustment over a wide range of operating speeds without changes in the standard springs. Thus the governor can be made as a standard package and yet provide variable-speed characteristics so essential for the gamut of industrial installations.

The main spring system, built into the governor assembly, permits of wide adjustment, combining resisting forces in direct opposition to thrust, thereby reducing friction to a minimum. A secondary, external, spring makes it possible to reduce engine idling speed at will by taking control away from the fixed governor adjustment.

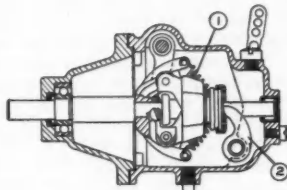
The reduction in friction is accomplished through use of ball and roller bearings at all points. Ball and roller bearings are used on the main shaft, needle bearings on centrifugal weight pivots at heavily loaded ends, and anti-

friction bearings at other points to assure sensitive control and long life. All thrust surfaces are hardened and ground.

The governor is designed primarily for belt drive and is arranged for universal mounting to suit the requirements of most engines. Whenever specified the governor can be supplied with a suitable valve box having the valve shaft mounted on ball bearings. An auxiliary valve box of this kind permits engine throttle to be changed manually from governed speed to slow idle. In fact this is recommended by the manufacturer where extremely close regulation is desired.

From the standpoint of the engine builder the important feature of this development is in the fact that a single standard governor assembly can be employed on the gamut of engines without special accessories or engine design changes. On the other hand, special packages are available for installation on certain large production engines such as: Chrysler industrial engines, Chevrolet, Ford Six and V-8, Ford Model A and B, Willys, and Mobilift. These packages include mounting brackets, pulley, belt, throttle rod, and where necessary, auxiliary valve box.

Cross-section of the governor, showing arrangement of weights and anti-friction mounting of the main shaft. Two of the built-in control springs (1) are attached to the stamped yoke at the thrust end. At (2) is the lever controlled by the external spring. Acting on the thrust end, this lever is instrumental in effecting the compulsory reduction in engine idling speed, overruling the governor setting through external manual control.



## How Shortages of Aluminum May Affect Passenger Cars

BACK in 1941 when the pinch on aluminum began to be felt, it affected engine pistons primarily so far as passenger cars were concerned. This time the limitation order on aluminum acts more deeply.

For one thing aluminum looms importantly in practically all automatic drives with the possible exception of Chevrolet Powerglide. Not only are valve bodies and some valve parts of aluminum but in the case of Dynaflo and Ultramatic the rotating elements of the torque converter are of aluminum.

Although Fordomatic, Mercomatic, and Studebaker have torque converters fabricated from steel stampings, only the latter is entirely free from aluminum. Both Fordomatic and Mercomatic have pump housings of aluminum to promote air cooling. Whether

or not this element could be redesigned in sheet steel and still retain the same effectiveness of cooling remains to be seen.

In any event, the replacement of aluminum in automatic drives is no simple matter. Granting that Buick and Packard could consider a stamped steel assembly, much time would be required just to create and prove the new design. From that point on it would require expensive tooling for the production of stamped parts. And even then the entire project would be rather nebulous since steel is in short supply and would not be readily available for new applications.

It would be even more difficult to design aluminum out of the present valve bodies. Chevrolet alone has a cast iron valve body. But it was initially designed for cast iron and is quite large

when compared with other makes. It would appear that if a shift were made to cast iron, the present aluminum valve bodies would have to be made larger to facilitate foundry practice. Whether or not this is feasible is problematic considering that present drives simply do not have excess space for housing a large casting.

Despite the evident drawbacks to the replacement of aluminum pistons with cast iron, the replacement can be made. In fact, it was done during the last war. From that standpoint, at least, it is more simple than the prospect of taking aluminum out of automatic drives. On the other hand, even a switch to cast iron pistons will require entirely new tooling and some changes in method. That cannot be done overnight.

(Turn to page 100, please)



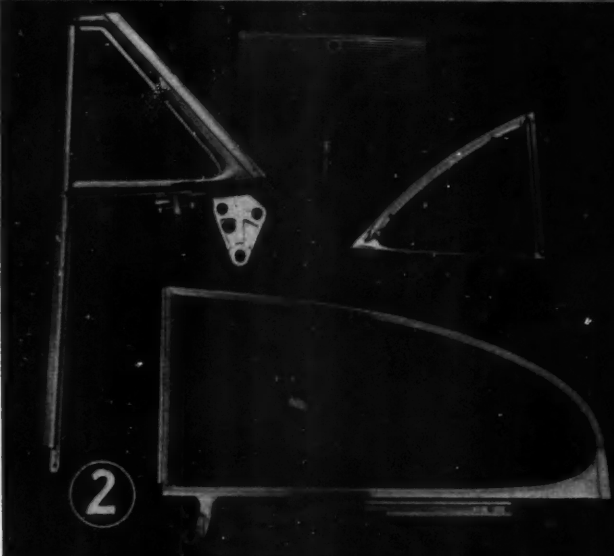
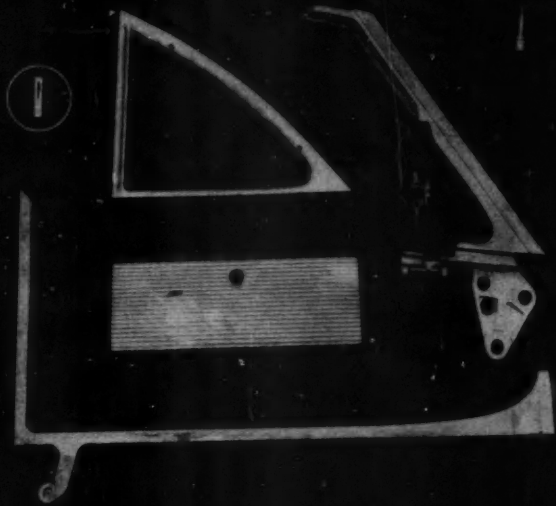
# New Methods Reduce Costs of Polishing Die Castings

By Joseph Geschelin

**A**LTHOUGH the art of making zinc die castings is no longer new, some remarkable advances are being effected in the quality of castings, in die casting machinery, and in methods of finishing to reduce the cost of polishing and buffing operations. These comments are based upon current activity under way at the Ternstedt Div., General Motors Corp., in preparation for the 1951 product program. Considering that Ternstedt consumes at least a carload of zinc a day it is only natural that this organization would lead the way in techniques contributing to cost reduction coupled with improved quality.

The illustrations reproduced here show a selected group of die castings representative of the largest parts currently in production; also one of the smaller pieces. The latter is of interest chiefly because of the unique die re-

(Turn to page 62, please)



**1.** Here is the group of five zinc alloy die castings described in the text. The Hardtop rear quarter frame is the casting at the lower edge in this view. Immediately above is the compartment door; and at the top the rear quarter garnish molding for larger sedans. The Hardtop CV frame is the part at the right. The small CV worm gear may be seen in the upper right hand corner.

**2.** This view shows the same five die castings as in No. 1, in finish-machined state, the Hardtop rear quarter frame and CV frame being completely assembled with stainless steel frames and small attachments ready for installation.

**3.** The two stations of the special polishing and buffing equipment at Ternstedt, used for interior hardware items, are shown here. The unit at the right handles the polishing while the one at the left is used for washing.



Overall view of press equipment in Air Force Manufacturing Methods pilot plant at Adrian, Mich.

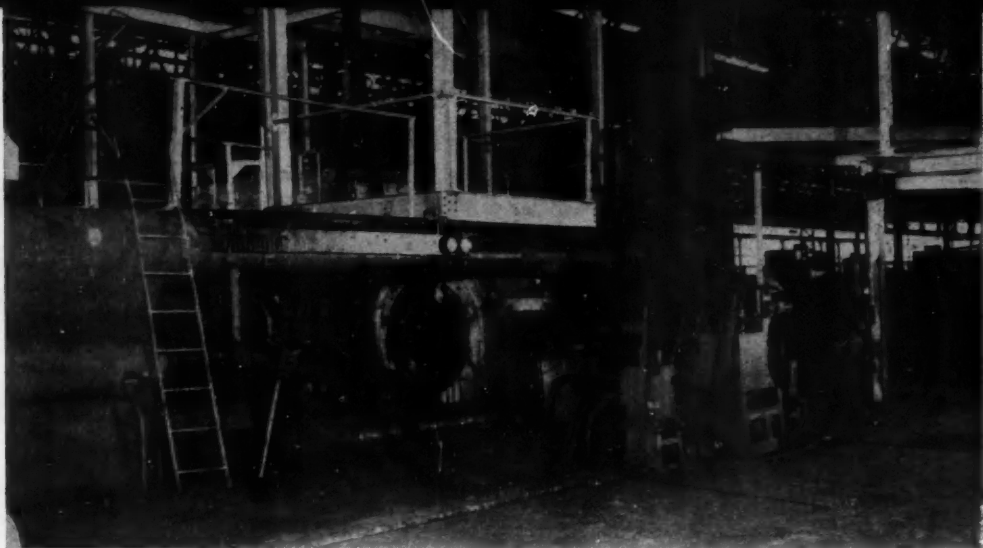
## Huge Hydraulic Presses Needed

Shown here is a 15,000 metric ton forging press as installed in Germany before being dismantled and shipped to the U. S. for erection at Adrian.



PRIOR to the close of World War II, the Air Force was cognizant of the great successes obtained in Germany by using both heavy horizontal extrusion and vertical hydraulic presses. To gain first-hand information, immediately following the war, trips were made by American industrial and military representatives through many of the German factories and these inspections and surveys revealed conclusive evidence of advanced methods of production.

The German aircraft industry had available one 30,000-ton press, three 15,000-ton presses and numerous smaller forge presses. This indicates that Germany's experience favored press forging of many aircraft parts which formerly had been cast, extruded or hammer forged. Similarly, the United States recognized the value of such parts and the United States Government in 1944 financed the construction of an 18,000-ton press which is operated now by Wyman-Gordon at North Grafton, Mass. Little knowledge and experience was gained during the war. The experiences and results obtained from this press, with the aid of German scientists and technicians during the past two years, have encouraged the Air Force to enlarge the facilities at this plant. Following surveys made in Germany, successful attempts were made through diplomatic channels to acquire some heavy German equipment for American industry. As a result, there will be installed a 7000-ton and a 15,000-ton German vertical press in this country. These presses have arrived in the United States and installation should be completed soon.



*This 5500-ton hydraulic extrusion press is installed at the plant in Adrian.*

## for Making Large Aircraft Parts

Parallel to rounding out the two forging plants, it was considered of importance to establish a facility for the development of techniques wherein greatly concentrated pressures, whether forgings or otherwise, might be placed at the disposal of industry. The needs for such a facility are obvious. During the past, the Government has spent millions of dollars to improve the performance of aircraft while very little has been done toward providing modern equipment which will enable the industry to reduce manufacturing costs. This applies particularly to airframes, landing gears and several other items. After lengthy consideration and study, it was deemed both economical and practical for the Air Force to sponsor the establishment of a Government-owned and industry-operated plant, containing both heavy extrusion and forging presses for manufacturing research work. A War Assets plant, ideal for the purpose, was located in Adrian, Mich. It is a World War II aluminum extrusion plant containing over 700,000 sq ft of floor space. In it are installed or in process of installation 14 hydraulic extrusion presses, ranging from 1650 tons to 5500 tons capacity and heavy vertical German forging presses of 15,000, 7000, 2000 and 600-

*(Turn to page 78, please)*

**By General K. B. Wolfe**

U. S. Air Force

*This 30,000 metric ton forging press, shown while still installed in Germany, was obtained by the Russians and moved back of the Iron Curtain.*

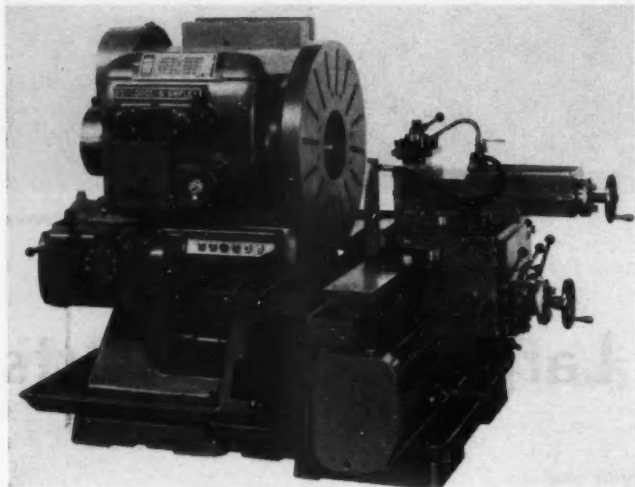




# NEW EQUIPMENT PLANT



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Lodge & Shipley 60-in. right angle chucking lathe.

## B-1—Right Angle Chucking Lathe

Lodge & Shipley Co., Cincinnati, Ohio, comes forward with a 60 in. right angle chucking lathe for facing, turning, and boring thin-walled section work of large diameter and short length. This right angle chucking lathe, it is explained, obsolesces dependence upon a raised engine lathe, gap lathe, or vertical boring mill for machining this class of work, by introducing a bed in the shape of a "T." The section of the bed carrying the carriage is at right angles to the center line of the lathe. Thus, facing at right angles to the center line can be accomplished by the movement of the carriage. Facing in and out a total of 31 in. from the center line to the front of the machine, as well as 6 in. to the back is readily accomplished.

The top slide, designed to have power angular feed in any direction and a total travel of 16 in., thus permits straight or taper boring or turning. The top slide can travel 12 in. in a forward direction and 4 in. to the back.

The headstock makes use of the "large hole in spindle" type. With it, workpieces that have an extension which will not be machined, can be

chucked or fixed to a driving fixture so that the workpiece extension can protrude through the hole in the spindle. A lot of the work which is adaptable to the right angle chucking lathe may be simply clamped to the face plate. The lathe, however, is also arranged so that the regular type of headstock may be used instead of the "large hole in spindle" type.

The four headstocks which may be used (all Model X) are: 25 in. standard hollow spindle 8 1/2 in. hole; 25 in. heavy duty hollow spindle 11 1/2 in. hole; 25 in. standard; and 25 in. heavy duty.

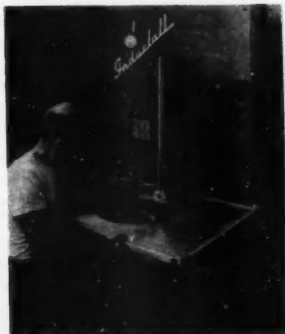
The 60 in. right angle chucking lathe is being used on a variety of turbo-jet engine parts being machined by the Pratt & Whitney Aircraft Corp., Experimental Div., E. Hartford, Conn. Workpieces handled best are generally light in weight, large in diam and relatively short in length. Materials commonly used are stainless steel and the lighter alloys.

The lathe provides independent control of the facing and turning feeds in either direction; built-in rapid traverse operating by light pressure on an apron control lever; direct reading dial and counter for the diameters; direct-read-

ing dial for lengths; and power angular feed in any direction. It also provides special pads on both sides of the facing carriage for use with gage-blocks; electric start and stop and Warner electric brake controlled from the apron; electric jog at headstock for changing spindle speeds; and selector switch at headstock for either forward spindle speeds and brake or reverse speeds and brake.

## B-2—Gear Hardening Machine

A new radio-frequency gear hardening machine for high-production heat treating of gears—the Inductall—available from Westinghouse Electric Corp., Pittsburgh, Pa., is used with a vacuum-tube radio-frequency generator, a 10,000-cycle motor-generator set, and other equipment, to harden spur gears, cluster gears, integral spindle gears, and also shafts. The machine carries each gear through an automatic cycle for either through- or contour-hardening. Uniformity of hardening results from the mechanical gear handling system and precise electrical timing of the pre-heat, heat-treat, and quench operations.



Westinghouse radio-frequency gear hardening machine—the Inductall.

The Inductall system is flexible, lending itself to expansion in increased production requirements. It is simple to operate and maintain, and does not require skilled labor. Designed for in-

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# NEW EQUIPMENT



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line production methods, it can help reduce handling costs, work-in-process inventories, and associated storage problems.

Automatic loading and unloading magazines are optional.

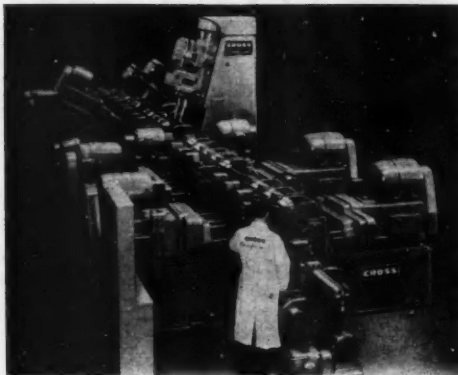
## B-3—Connecting Rod Balancing Machine

A fully automatic special machine for balance milling connecting rods to within less than 2 grams variation in overall weight, with a production rate of 144 pieces an hr at 80 per cent efficiency and 180 pieces at 100 per cent efficiency, has been designed and built by Snyder Tool & Engineering Co., Detroit, Mich.

The machine is designed to accomplish balancing to closer tolerances than hitherto possible in processing forged steel connecting rods. Operation is entirely automatic after locating the workpiece and pressing the cycle button. Unskilled labor may be used.

When the operator loads the workpiece over the locators and presses the

Cross machine for finishing automatic transmission cases.



visual check as to whether the parts are in balance.

Balancing is accomplished in one pass milling and conforms to tolerances of 1/16 oz (1.7 grams) on either end and in overall weight. The machine is equipped with a safety switch which

## B-4—Transmission Case Finishing Machine

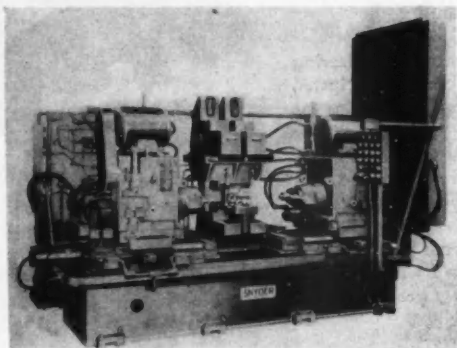
The Cross Co., Detroit, Mich., has designed, built and delivered to a large automotive producer, a new machine for finishing automatic transmission cases. A Transfer-matic—Cross' name for its machine tools having automatic devices for transferring parts from station to station—it drills, chamfers, reams and taps 32 holes in the ends, sides and tops of 85 automatic transmission housings per hr at 100 per cent efficiency.

Operations are conducted at 28 stations. The first station is for loading and is followed by 7 drilling and 5 idle stations for the ends; 1 for indexing; and 10 drilling and 4 idle stations for the sides and top. Eighty-three tools are used.

Only one unskilled operator is required, the parts moving automatically from station to station. At station 14, the piece automatically indexes for subsequent drilling of the side and top.

A feature of the machine is use of the recently announced Cross machine control unit with Toolometers. The Toolometers automatically stop the machine when tools need changing. The unit stores pre-set tools, eliminating downtime adjustments for tool changing. The control board of the machine control unit instantly identifies the station at which tools need changing and enables the operator to group tool changes, further reducing downtime.

Other features include hydraulic feed, rapid traverse, and use of standard Cross sub-assemblies to facilitate maintenance. Flexibility for reasonable part design changes is provided.



Snyder connecting rod balancing machine.

cycle button, the workpiece is automatically weighed and the scales register the amount each end is out of balance and transmits to the units on both sides, signals which set up these units for correct stock removal.

The part is then clamped by an automatic, hydraulic clamping mechanism and both units advance to the part finder. The lower unit stops and the cross slide feeds the cutter across the part. Units then return to their original position, the fixture opens, releasing the part and the scale gives a

emergency returns units if stock removal necessary for balance would go beyond maximum machining dimension allowable. (These parts could still be salvaged, reducing scrap to a minimum.)

The machine is a double-end, single station type with welded steel base, adequately ribbed and thoroughly normalized. Necessary floor space is 62 in. by 129 in.

Tool speed is 654 rpm at 300 fpm with 1 1/4 in. diam tungsten carbide tipped end mills. A V-velt and gear

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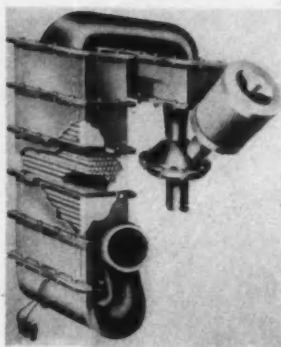
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# NEW PRODUCTS

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Oxy-Catalyst Mfg. Co. OCM catalytic exhaust.

## C-1—Catalytic Exhaust For Gas Lift Trucks

To solve the problem of obnoxious gases from gasoline-powered lift trucks, Oxy-Catalyst Mfg. Co., Inc., Wayne, Pa., has introduced the OCM catalytic exhaust. Installed like any standard exhaust, the OCM exhaust renders exhaust gases non-poisonous and odorless. This is accomplished by a catalyst (reacting agent) built into the OCM exhaust. A development of Eugene J. Houdry, pioneer inventor in the field of catalytic research.

The OCM exhaust can be adapted to any type lift truck, installed in place of the standard muffler and requiring approximately the same amount of space. It weighs approximately twenty-five to thirty lbs, with supports and brackets.

Operation is guarded by a pyrometer installed on the instrument panel. When the temperature is in the indicated "safe range," the Catalytic Exhaust is operating satisfactorily. The pyrometer also measures the air-fuel ratio of the engine, enabling constant check on engine efficiency. High temperatures indicate rich mixtures—excessive fuel consumption—or that the engine is burning excessive oil.

The catalytic exhaust is stated to impose no more back pressure on the engine than the standard muffler. Its housing is constructed of pressed steel box sections bolted together and the catalyst itself, is very stable physically

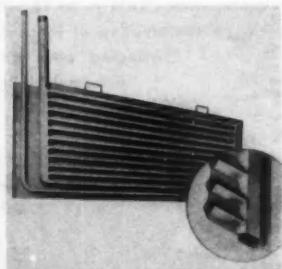
and chemically. For maximum efficiency it is recommended that the catalyst be replaced every three thousand hours of operation. Replacement cost for the catalyst is low.

The OCM exhaust operates only on unleaded gasoline, making it entirely safe for inside factory use.

## C-2—Plate-Coils for Industrial Heating

A method of industrial heating that requires only 50 per cent of the steel needed for conventional methods, is embodied in a new product known as the "Platecoil," placed on the market by Kold-Hold Mfg. Co., Lansing, Mich.

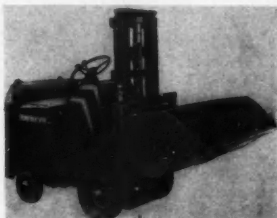
Designed to do the job of conventional pipe coils, "Platecoils" take only half as much space in the tank, and have more than doubled the BTU capacity per sq ft area, it is pointed out. For instance, a 22 in. by 19 in. "Platecoil," weighing only 95 lbs, has the same heating capacity as a 2 in. pipe coil weighing 239 lbs. Use of a "Platecoil" this size therefore saves 144 lbs of steel. Because of this savings in material, the initial cost of "Platecoils" ranges 50 per cent or more below the cost of equivalent pipe coils. Installation costs are much less, too, as no welding of pipe fitting is required. Due to their light weight, units are easily handled with a minimum of effort. They are installed in a half-hour or less by one man and a helper through use of unique quick-change hangers. When maintenance is required, units are removed and replaced in a matter of minutes without dumping the contents of the tank.



Kold-Hold style 90 Platecoil with inset showing cut-away section.

## C-3—Hydraulic Scoop Accessory

Time-saving materials handling development of Towmotor Corp., Cleveland, Ohio, is a hydraulic scoop accessory which swiftly picks up, transports and dumps bulk materials such as coal, sand, cement, scrap and many other similar items. Actuated by a two-way hydraulic cylinder, the accessory offers positive, finger-tip control of the angle



Towmotor Hydraulic Scoop Accessory

of the scoop. With the lift truck's mast in vertical position, the hydraulic scoop will tip 45 deg forward for dumping the load and 30 deg backward for carrying the load. Quick-detachable couplings in the hydraulic lines leading to the scoop, and simplified suspension from the fork support shaft, make the accessory readily interchangeable with standard pallet forks. With full open throttle, the scoop can be dumped from the carrying position in approximately 3 seconds on the Model LT-35 Towmotor lift truck, 2 seconds on the LT-40, 44 and 48, and 1 second on the larger Towmotor models. The only variable dimension on scoops of different capacities is the overall width.

## C-4—Multi-Purpose Grease

A new oxidation inhibited multi-purpose grease, Cosmolube, which meets practically all the grease needs in the average industrial plant, is a product of E. F. Houghton & Co., Phila., Pa. A feature making it highly versatile is its resistance to high heat, cold or wet conditions. Cosmolube is a cold-milled grease of a very smooth texture, with excellent oxidation stability. Clinging well to all metal surfaces, it reduces

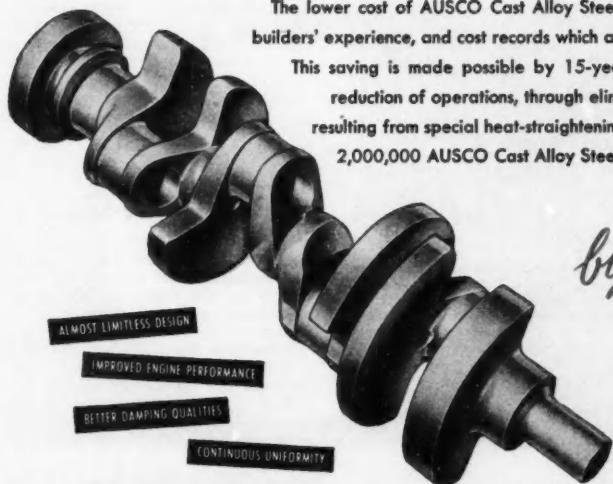


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of the cost-saving and other advantages of AUSCO Cast Alloy Steel Crankshafts awaits interested automotive engineers. This book of photographs, charts, test and performance records will be submitted in person on request.



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82204

# NEW PRODUCTS

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leakage to the barest minimum. The grease is available in two consistencies, NLGI No. 1 and No. 2.

## C-5—Inkless, Fume-less Copying Machine

Designated the BW Copyflex, a new type office copying machine announced by the Charles Bruning Co., Inc., New York, N. Y., is declared the first machine specifically designed to make low-cost direct positive copies anywhere in a business office. This quick, clean method of privately making low-cost, errorproof copies, uses the BW Diazo process. (Using larger Bruning machines, this Diazo process has long been employed by many automobile manufacturers to make inter-office copies of designs, specifications and other communications.)

The BW Copyflex makes copies fast, neatly, and easily, eliminating much office paper work and permitting the economy of "desk-side" copying without special operator training.

The entire copying process, accomplished within the machine, requires no inks, tray developing, dark rooms, subdued or special lighting, stencil or negative, has no annoying fumes, and does not require "make ready," plumbing, or exhaust fans.

In seconds, and without adjustment, the machine copies any size of original matter up to 11½ in. wide by any length. Copies are clean, smudge-proof, and exactly like the original matter, with the last copy as sharp and legible as the first in any quantity.

Claimed the lowest cost copying method devised for quickly producing one to one hundred copies in an average office, the cost of an 8½ in. by 11 in. size copy is said to average under 2¢, including labor, materials, machine depreciation, etc.

Needing no installation, the machine can be placed anywhere in an office by connecting to the ordinary office electric light line carrying standard 60 cycles, 110 volt ac. Only 29½ in. wide, 28 in. deep, and 50 in. high, it is easily moved from room to room.

The Diazo process is based on paper coated with an aniline dye. Within the machine this dye coating is bleached by actinic light rays, except where the record or document to be copied has markings, such as typing, printing, or line-drawing. These markings prevent light from bleaching the dye and a sharp, clean, black line is formed, reproducing exactly the markings on the

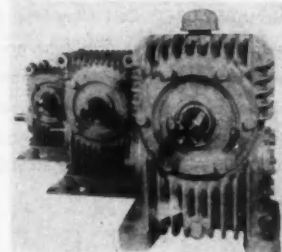


Bruning office copying machine, the BW Copyflex.

original evidence record or document.

If the original document is marked on both sides or is on opaque stock, the machine quickly copies it onto BW reflex film and the film is then used to make copies. Both sides of an original can be copied. As with the paper, no dark rooms, special lighting, washing tanks, or tray developing are needed, as all exposing and developing of the film is done within and by the machine.

## C-6—Improved Speed Reducers



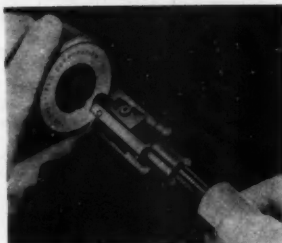
Line of Cone-Drive standard duty speed reducers announced by Cone-Drive Gears, Division of Michigan Tool Co., Detroit, has improved appearance and greater casting uniformity. Employing double-enveloping gearing, all operating parts in the improved standard line are directly interchangeable with former models. Shown left to right are reducers of 2, 2½ and 3 in. center distance, available in standard ratios of 5/1 to 50/1 and (60/1 on the 3 in.). Hp ratings range to 9.04 hp at 1750 rpm.

## C-7—Adjustable Gaging Plugs

Adjustable gaging plugs or spindles for use on practically all makes of air gages, placed on the market by the Sheffield Corp. of Dayton, Ohio, are of the ball-jet contact type, and are available in either through-hole or blind-hole styles. They provide a relatively inexpensive means of precisely measuring internal diameters within all or any part of a range from one to three inches inclusive. No master rings are required for setting the spindle to size. This is done with a special fixture and gage blocks.

A Sheffield adjustable air spindle consists of tapered core and four clamps to hold the blades in place, together with a set of four blades, two of which have inserted ball-jets. The full range of one to three in. can be covered with 4 sets of blades and 8 cores; any one-in. range can be covered with 2 sets of blades and 8 cores; any half-in. range, 2 sets of blades and 4 cores; any ¼-in. range, 1 set of blades and 4 cores; any ⅛-in. range, 1 set of blades and 2 cores; any 1/16-in. range, 1 set of blades and 1 core.

Only one minimum and one maximum setting ring are required. These are for calibrating the air gage for proper am-



Sheffield adjustable gaging spindles.

plification. They should be of a size corresponding to an adjustable spindle on hand. These spindles are recommended for air gages having amplification of 2,000 to 1 or less. However, some users may find that they can set the spindles to size accurately enough to use on gages of higher amplification.

## C-8—Color Added To Abrasive Stones

The Industrial Products Div. of the Elgin National Watch Co., Elgin, Ill., announces a line of silicon carbide and aluminum oxide abrasive stones to provide a more complete selection of finishing and polishing supplies for tool, die and mold makers.

A feature of the line is color identification for instant selection of the proper stone. Each stone is permanently color tipped in a brilliant range from black to yellow according to its



# Chrome Sweet Chrome

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# NEW PRODUCTS

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grit size. Hardness and cutting characteristics are precisely controlled.

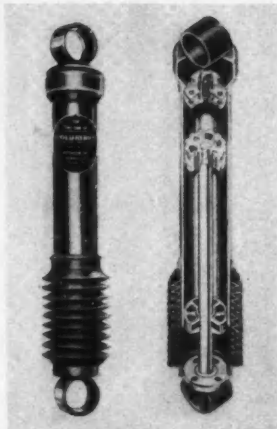
Sizes, shapes and cutting characteristics are said to meet every fine finishing need.

Sold under the trade name, Elgin Dymo, the stones range in size from ¼ in. by 4 in. to 1 in. by 6 in., from 220 to 600 grit and from extra soft to medium hard. Rectangular, square, triangular, half-round and round shapes are available.

## C-9—French Hydraulic Shock Absorber

Heckethorn Mfg. and Supply Co. of Littleton, Colo., has acquired from Columbus Automotive Corp. of New York, exclusive manufacturing and sales rights in the United States of the Columbus Luxury-Ride shock absorber.

A new type of direct action, hydraulic shock absorber, it embodies a theory of viscous damping designed by Bourcier De Carbon, French engineer. The shock absorber has been adopted as original



Columbus Luxury-Ride shock absorber, revealing design.

standard equipment in Europe by several automobile manufacturers, including Simca, Renault, Peugeot, Ford of France, and others.

By reversing the standard method of mounting, with the rod issuing from the bottom of the single cylinder, provision is made for air to be separated from the hydraulic liquid and lodged permanently at the top of the unit. According to the manufacturer, this has never before been accomplished and performs wonders in smoothing out the ride.

An unusual design of piston permits the liquid to pass around the outside of the piston and also through orifices within the body of the piston under controlled conditions. The piston also contains a new thermostatic element for controlling the flow of the liquid in proportion to temperature changes.

Problem of retaining the liquid within the cylinder, the manufacturer states, has been solved by designing an entirely new type of seal using a combination of steel, rubber and die castings. This design prevents foreign elements from passing through the seal, thus preserving its life and also preventing wear on the piston shaft.

A rubber bellows type shield which expands and contracts with the movement of the piston rod eliminates noise and rattle, deflects stones without damage to the unit, and is designed to keep dust and grit from attaching itself to the piston rod.

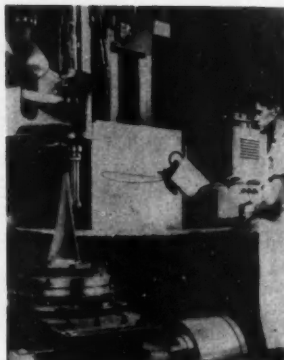
# NEW PRODUCTS for AIRCRAFT

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 64

## R-1—Electronic Contour Follower

A faster, more efficient and cheaper method of producing compressor blade masters for jet engines, developed by the Pratt & Whitney Aircraft division of United Aircraft Corp., East Hartford, Conn., uses an electronic contour follower. This follower has cut the cost of a single compressor blade master from over \$4,000 to \$100 and has reduced the time for making a blade master—taking four to six months—to only three working days.

The Pratt & Whitney Aircraft contour follower utilizes a special electronic machine automatically linked to a standard jig borer. A cross sectional metal drawing of the air-foil contour desired at any particular point in the master blade is fed into the electronic machine. There a photo-electric eye



Pratt & Whitney electronic contour follower used in producing axial flow jet engine compressor blade masters.

scans the drawing and feeds the information to the jig borer which faithfully reproduces the air-foil contour in the metal blank from which the blade master is made.

The number of cross-sectional cuts required is determined by the length and twist of the blade desired. A comparatively easy hand-finishing operation removes the metal between cross-sections cut by the jig borer and blends the various air-foils to make the finished blade master.

The blade master is accurate to a tolerance of one-thousandth of an inch. The finished blade master can be rapidly duplicated on multi-spindle profiling machines that produce four blades at a time from the blade master.

The electronic part of the contour follower was developed under contract for Pratt & Whitney Aircraft by the General Electric Corp.

(Turn to page 62, please)

Drivers

# Get tired -

## when they do part of the horse's work



In the days when horsepower had four legs and was fueled with oats, drivers did not steer vehicles. They guided the team and the animals supplied the work of turning.

Today, with trucks, buses and materials handling equipment many times heavier than any horse-drawn vehicle, the driver too often has to supply the physical effort. The power to turn must come from his arms, shoulders and back.

He's doing part of the work that used to be done by horses. No wonder he tires and loses efficiency. It takes a lot of work to herd a vehicle that has heavy loading on the steering axle.

It's hardly progress to eliminate the horse and then do some of his work.

Vickers Hydraulic Power Steering doesn't give that work back to the horse—it gives it back to horsepower. It takes the work out of steering . . . requires no more effort than a "flick of the reins". Wheeling a vehicle around is much less tiresome, so, naturally the driver can do his job better and with greater safety.

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Ask for Bulletin 47-30a and  
data sheet #120397 for further  
information on these units.



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**POWER STEERING**

Is Effortless, Positive and Shockless



# NEW PRODUCTS for AIRCRAFT

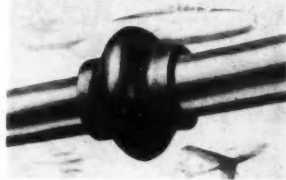
For additional information regarding any of these items, please use coupon on page 64

(Continued from page 60)

## R-2—Neoprene Rubber Joint Compound

In production by the Stalwart Rubber Co., Bedford, Ohio, is a molded rubber cover grease retainer for aircraft universal joints, developed primarily for military aircraft reaching altitudes above 40,000 ft, where they are subject to high concentrations of ozone as well as extremely low temperatures of altitude flight.

The new Stalwart No. 808 Neoprene-based rubber compound selected for the application has withstood concentrations as great as 0.003 per cent of ozone for a six-hr period, as well as temperatures as low as -87 F and as high as 240 F. This No. 808 Neoprene-based compound has a tensile strength



Universal joint cover of Stalwart No. 808 Neoprene-based rubber compound.

of 2315 lbs per sq in., a durometer hardness of 60, elongation of 400 per cent, and a permanent set of 3 per cent. The compound is resistant to petroleum products and their derivatives, prolonged weathering, constant flexing, and the wear resulting from a metal-to-rubber contact in this application, the company reports.

## POLISHING DIE CASTING

(Continued from page 49)

quired to make it. This part is the worm gear for the CV gear housing, the worm gear being a zinc die casting, using the shaft as an insert. It is interesting to note that after the casting has been completed, the individual pieces are screwed out of the die by hydraulic pressure behind the platen.

The rear quarter frame, used in hard-top models, is in the form of an angle, as shown, with a deep channel section accurately cast in. The short leg is about 13 in. long, the longer leg is about 28 in. long. In the rough, the casting together with sprue and overflow weighs about 4½ lb. It cleans up to around 3¼ lb when trimmed.

The CV frame, also used in hard-top models, weighs about 4½ lb with sprue and overflow, trims to 3½ lb.

About 14 in. in length, presents quite a problem in production due to a tendency to warpage because of the effect of the decorative ribs. On the current model, warpage has been corrected by forming after the casting is removed from the machine. This is a simple operation of correcting curvature in a hand-operated die. A longer, 18-in. door designed for 1951 may present a more difficult straightening problem.

The garnish molding, a one-piece frame over the rear quarter window of large sedan models, marks an interesting development in cost economy. Usually the garnish molding is made of

steel. But in this instance the volume required for larger sedan models did not justify an investment in tooling for a steel frame. The zinc die casting in this case was found to be the more economical method.

One of the major problems in a die casting plant is that of buffing and polishing in preparation for electroplating. In recent years considerable progress has been effected with the introduction of automatic polishing machines of various types, including the larger merry-go-round conveyor installations. Nevertheless, even though direct labor has been decreased thereby, there is considerable cost burden in time and in the cost of buffs and compound.

For some time Ternstedt has had in operation a special technique, using more or less experimental equipment in production. In this process the work is mounted on a large cylinder which is then fitted on a rotating spindle in the special machine. The work is immersed in a tank containing a relatively dry polishing compound where it is revolved (while on the cylinder) first in one direction of rotation, then in opposite direction, each cycle being accurately timed. The complete cycle takes a matter of a few minutes altogether.

Then the cylinder is removed from the machine and placed in a similar machine where it is rinsed clean. At this stage the parts are suitable directly for

## R-3—Aluminum Coating

The American Chemical Paint Co., Ambler, Pa., offers a kit which contains sufficient chemicals to alodize 1000 square feet of aluminum in the shop, or afield, by means of a simplified brush-on technique.

Alodine produces a thin, skin-like coating on aluminum and its alloys, without high temperatures or expensive electrolytic equipment. The coating becomes a part of the metal itself, creating a non-metallic protective surface that is highly corrosion resistant in industrial, humid, and salt-laden atmospheres.

Alodized aluminum tenaciously holds paint and prolongs the life and beauty of both the metal and its organic finish, the company says, comparing favorably with the oxide film created by elaborate anodic processes as well as by alkaline chromate treatments.

The Alodine Brush-On Kit is designed to enable the most inexperienced to thoroughly treat and protect aluminum in the shop—hangar—or in the field. It consists of 2 qt bottles of ACP "Deoxidine," one qt bottle of "Alodine" Liquid, and one 2 lb canister of "Alodine" make-up powder.

The kit is particularly adopted for use on large aluminum assemblies.

electroplating. In effect, therefore, this technique eliminates all buffing and polishing operations on a wide variety of die cast parts.

Ternstedt has on order, and expects soon to install, some new automatic equipment employing this principle. When installed in 1951 production it will make possible the elimination of many of the automatic polishing lines now in use. It is anticipated that this move will pave the way for economies in polishing and materials costs.

On the other hand, the new technique uncovered other problems requiring immediate solution. The completely automatic cycle and the elimination of corrective hand operations has made it imperative to improve die casting quality so as to assure better skin condition on castings handled in this manner.

This has led to the development of larger and more rigid die casting machines capable of handling higher hydraulic pressures incident to the controlled shot of metal required to produce a denser structure. With higher pressures the machine must be able to handle the job without deflection of platens and dies.

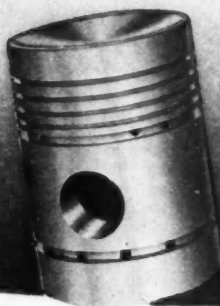
A large battery of these die casting machines is now under construction and will be ready for installation in time to meet 1951 schedules. Thus the adoption of this polishing technique has impelled development into new channels spelling improved methods of producing better die castings.



Air Craft



Nelson



Standard



Trans Slot



Wing piston



Two Cycle



Steel Truss



Turbulator head



T-Slot



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# Publications

## AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

### A-1 Industrial Tools

Cornwell Quality Tools Co.—Catalog 50, a 72-page booklet concerning the firm's line of industrial tools, has recently been made available. It gives complete specifications on thin wall or hand type and power type sockets and attachments; impact sockets, attachments and accessories; and maintenance tools such as wrenches, screwdrivers, pliers, etc.

### A-2 Saw Blades

The Motch & Merryweather Machinery Co.—Triple-Chip solid and segmental circular saw blades as well as automatic saw blade sharpeners are described in Bulletin No. 201, just off the press. Two tables give complete data and specifications for all standard size blades.

### A-3 Position-Proportioning Relay

Minneapolis - Honeywell Regulator

Co.—The Electr-O-Line relay which provides automatic reset as well as means for manual control and independent adjustment of reset rate and proportional band is described in Specification Sheet No. 194.

### A-4 Surface Grinders

Mattison Machine Works—Full details and specifications of the firm's vertical spindle surface grinder are contained in bulletin, No. 847-2RM. It is one of a series of bulletins to be released on the machines formerly made by Hanchett.

### A-5 X-Ray Photometer

General Electric Co.—A new eight-page, two-color bulletin on the X-ray photometer for chemical analyses by X-ray absorption has been made available. Designated as publication GEC-412A, it lists some of the applications for the instrument in the petroleum and chemical industries.

### A-6 Insulation Material

Dow Corning Corp.—The first two pages of a new series of data sheets describing silicone dielectrics have just been published. They give the most recent data on DC 993 and DC 996, the silicone varnishes used for electrical insulation.

### A-7 Springs

Accurate Spring Mfg. Co.—A new revised and enlarged edition of the "Accurate Handbook of Technical Data on Springs" is now available. This 40-page booklet offers many helpful short cuts for making spring calculations as well as full data on specifying springs.

### A-8 Fork Extensions

Towmotor Corp.—Now available is a new Accessory Data Sheet on fork extensions for handling loads longer than those ordinarily carried on the regular forks of a lift truck.

### A-9 Blower Wheels

Torrington Mfg. Co.—Publication of a new 48-page catalog, "Torrington Airotor Blower Wheels," has just been announced. The catalog gives full specifications and performance charts on several new Airotor models and features the Coasting Hub.

### A-10 Automobile Finishes

E. I. du Pont de Nemours and Co., Inc.—The full history of the creation (Turn to page 80, please)



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During forty-seven years of America's advancement to international supremacy, Spicer has developed an ever-growing family of power-transmission products that has become the standard of the automotive world.



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**RECOGNITION** of responsibility...in every detail of engineering, manufacture and service... has always been a Spicer obligation.

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**FACILITIES** for the production of the Spicer line are the most modern and efficient in the automotive industry, and are available in their entirety to you. **SPICER MANUFACTURING** Division of Dana Corporation, Toledo 1, Ohio.



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# GMC 1951 Light Duty Trucks

(Continued from page 46)

been upped to 114 bhp at 3600 rpm. Maximum torque remains the same—182 lb ft at 1200-2000 rpm for the "228" and 202 lb ft at 1200-1400 rpm for the "248."

New features common to both engines are as follows: They are equipped with new inlet manifolds providing increased power and improved fuel economy. The vaporizer in the center of the inlet manifold has been reduced in area to better control pre-heating of the fuel charge and increase volumetric efficiency. Valve lifters have been changed to a two-piece type which permits shortening of valve push rods. The lower end of the push rod now rests on top of the valve lifter instead of in the bottom of valve lifter cavity. The engine oil pressure gage line has been shortened to permit reading of correct oil pressure in extremely cold weather in a shorter time after the engine is started.

On the "228" engine only, some special features have been added to permit safer high speed operation. In the main, these consist of providing lighter weight aluminum pistons; and use of a deep wall 3/32 in. wide top ring, replacing the present standard 1/8-in. ring.

On the "248" engine only, exhaust valves now are equipped with Eaton Free-Valves. This engine also is fitted with a 1 1/2-in. carburetor for improved throttling and better fuel economy.

On Model 100-22, service brakes have been changed to the new Duo-Servo type and front brakes have been widened by 1/4 in. This increase in width was to provide life equal to the new rear brakes.

On models 280-22, 300-24, S300-24, 350-24 and F350-24, the front brake cylinders have been enlarged from 1 1/4 in. to 1 1/2 in. diameter to obtain more powerful front brakes, to keep in line with the new, more powerful rear brakes on these models which are now of twin cylinder type. This modification to rear brakes is in line with the "H" model hydraulic brakes which went into production last year. In addition, the hand brake has been removed from rear wheel brakes and replaced by a separate hand brake installed on the rear of the transmission. This is of the dual-shoe type in which shoes engage the inside and outside of the transmission brake drum. The single pair of brake shoes leave a very large exposed drum area which aids in cooling.

A new 4500 lb front axle now is standard on models 280-22 and 300-24, 1 1/2 ton trucks, replacing the 3500 lb capacity axle used on 1950 models.

On models 280-22, 300-24, S300-24, 350-24 and F350-24, rear axle shaft flanges have splined teeth cut in their

circumference and engage matching teeth broached into wheel hubs. The opening of the hub is covered with a steel cover and gasket, making it an oil-tight closure. This assures strong positive drive to the wheels, and in addition provides slight universal joint action, thereby relieving axle shafts of bending strains. As a result, rear axle rating has been increased from 10,500 lb to 11,000 lb on models 280-22, 300-24 and S300-24; and on the 350-24 and

F350-24 from 12,500 lb to 13,000 lb.

Rear brake drums are changed from centrifuge to heavy section cast iron for greater heat dissipation.

All 1951 GMC light and medium duty cabs will incorporate as an additional comfort feature to the fresh air system now in use, C/V windows or controlled ventilation windows. These ventpanes in the door glass still allow ample room for drivers to lean out of cab.

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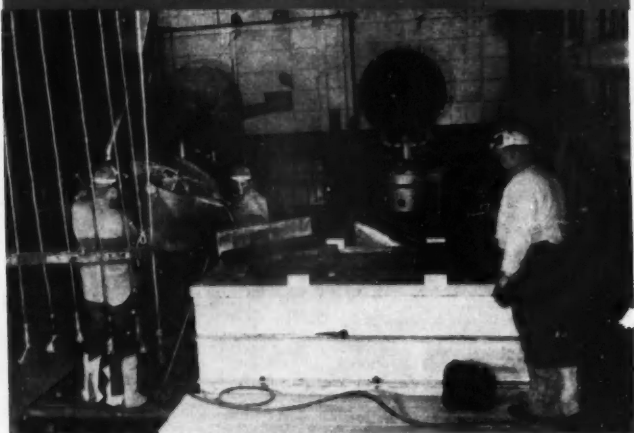
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## Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity early in December continued at a level substantially above that of a year ago. Increases during this period were reported in department store sales, bituminous coal production, construction, electric power output, and railway freight loadings, while crude oil production declined. For the week ended Dec. 2 the *New York Times* index of activity stands at 166.1, as compared with 166.5 in the preceding week and 148.9 a year ago.

The dollar value of department store sales in the week ended Dec. 2, as reported by the Federal Reserve Board, was equal to 444 per cent of the 1935-39 average, as compared with 319 per cent in the week before. At this level, the value of sales was one per cent less than in the comparable week of 1949. The total reported since the beginning of the year was five per cent more than the corresponding sum in 1949.

Production of bituminous coal and lignite in the same period is estimated at 9,400,000 net tons, 350,000 more than output in the week before but 148,000 less than the comparable amount in 1949.

Civil engineering construction volume reported for the five-day week ended Dec. 7, according to *Engineering News-Record*, was \$484.9 million, as compared with \$260.3 million in the preceding week. The total recorded since the beginning of the year, at \$11.4 billion, is 46 per cent more than that in the corresponding period of 1949.

Production of electric power rose moderately during the week ended Dec. 2. At 6716 million kilowatt-hours, total output was 16.9 per cent above the amount a year earlier, as compared with an advance of 17.5 per cent shown in the preceding week.

Railway freight loadings in the same period totaled 739,922 cars, 5.5 per cent more than the figure for the week before and 6.6 per cent more than the corresponding number a year ago.

Crude oil output in the week ended Dec. 2 averaged 5,825,220 barrels daily, 62,650 less than in the preceding week but 719,270 above production for the similar period in 1949.

The wholesale price index of the Bureau of Labor Statistics for the week ended Dec. 5, at the new record level of 172.6 per cent of the 1926 average, was 0.5 per cent more than in the preceding week and 14.2 per cent above the comparable figure for 1949.

Member-bank reserve balances increased \$250 million during the week ended Dec. 6. Underlying changes thus reflected include increases of \$421 million in Reserve-bank credit and \$155 million in money in circulation. Decreases of \$61 million in the monetary gold stock, \$24 million in Treasury deposits with Reserve banks, \$15 million in non-member bank deposits and other Federal Reserve accounts, and \$4 million in Treasury cash were also reported.

Total loans and investments of reporting member banks increased \$255 million during the week ended Nov. 29. An advance of \$109 million in commercial, industrial, and agricultural loans was recorded. Total business loans, at \$17,097 million, were \$322 million more than the comparable sum a year ago.





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AUTOMOTIVE INDUSTRIES, January 1, 1951

# Swaged Pole Shoes Conserve Copper Wire

(Continued from page 41)

shaped rolled section required before. For the size of shoe here considered, the stock is 3 in. wide,  $0.516 \pm 0.020$  in. thick and is purchased in 10-ft lengths. For blanking, these lengths are fed automatically by rolls, as shown in Fig. 2, to duplicate setups in two No. 506 Bliss presses.

In these presses, the blanks are cut to length and corners are cut off at 45-deg angles to yield the blank A, Fig. 1. One man tends two presses

and also a washer into which the blanks feed automatically on conveyors. The shearing of the piece is done along the wide edge and, by having the corresponding edge of the top die 0.060 in. ahead of the edge of the lower die, double shear is avoided and a clean fracture results, although the edge produced is not square. Blanks fall onto the conveyors that feed the washer. Each press runs continuously and produces 40 blanks a minute. Dies in the

presses mark each blank to indicate its lower face.

After tumble washing to remove scale, the blanks feed automatically from the washer down a chute, left in Fig. 3, to the bed of another No. 506 Bliss press that runs continuously. There, the blanks are fed by hand into a hole above an automatic sliding feed that moves the blanks successively at the rate of 45 per minute into the press die where each workpiece dwells long enough to be formed or bent to the required arc. The setup is such that metal distribution is the same at each side of a vertical plane through the center of the arc radius. Feeding is done with the marked side down, as this brings the angles of sheared edges of the blanks into best position after forming. Each blank is pushed from the die by the next piece fed in. The ejected piece drops into a chute, sliding into a tank of trisodiumphosphate held at 180-200 F and a specific gravity of 1.06-1.08. Time in this tank is one minute and pieces are removed by a conveyor that feeds the chute at a piercing press, left in Fig. 4.

Piercing dies in this No. 26½ Bliss press handle two pieces per working stroke and the press runs continuously. Feeding is done automatically from two magazines that are kept filled by the operator who inserts each piece with its concave face down. After piercing with punches of 0.339-in. dia. the two workpieces are advanced automatically to a second position where conical punches form a countersink at the top ends of the two holes.

Upon ejection from the dies in this press, the workpieces fall on a conveyor that elevates them into a hopper. They then appear as at C, Fig. 1, and are ready for the swaging operation which is done in two 500-ton Lake Erie hydraulic presses, each performing the same operation. From the hopper, the workpieces feed down two chutes, one leading to each press.

The purpose of the swaging operation is to cold flow metal in such a way that a flange is formed all around the workpiece, converting it from the shape shown at C, Fig. 1, to that at D in the same illustration. In so doing, a boss having well rounded corners is left at the center. It is around this boss that the coil is subsequently placed, resting against the flange. Some shearing of the metal may occur at the periphery of the boss but its contour remains smooth. It is the metal outside the boss that is forced to flow by the pressure applied, and it is this metal that produces the flange.

In the lower die employed, there is an opening into which the boss portion is forced as formed and its lower face retains the shape given it in prior forming (bending). The upper half of

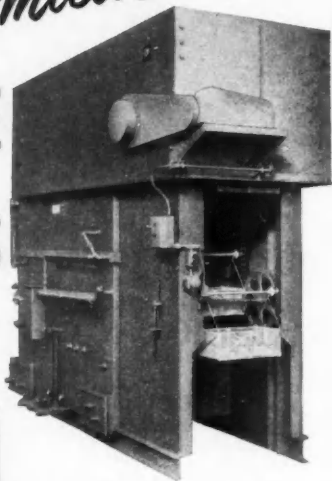
(Turn to page 72, please)



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AUTOMOTIVE INDUSTRIES, January 1, 1951

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the die (that is, the punch) is convex and, in that area above the pole core, fits the concave face of the workpiece. In consequence, little pressure is applied to the boss and the thickness of metal in this area remains practically unchanged, as does also the curvature on both faces of the boss.

Actually, the pressure is applied chiefly to the metal that forms the flange, and the flange produced is only  $\frac{1}{4}$  in. thick close to the boss. From this point outward, however, the die is relieved and the flange is somewhat thicker. There is nothing to restrain the flow of the metal around the periphery of the flange and, as the pressure is applied, the metal is forced or extruded outward in all directions away from the pole core, flowing, of course, in the path of least resistance.

Although the flange produced is curved, its top face does not quite follow the same arc as that of the area above the boss. As the flange increases somewhat in thickness from the boss outward, the arc of its lower face is not parallel to that on its upper face. At the center of the punch there is an extension having a conical end. This extension enters the hole previously pierced and countersunk and centers the workpiece in the die.

Dies are made from high chrome, high carbon steel and produce an average of about 75,000 pieces before regrinding is required. Wear is chiefly in the areas against the flange where the metal is extruded outward by the pressure applied. As the surfaces that need regrinding are cylindrical arcs, this grinding is not a difficult or expensive operation and the amount of metal removed is small.

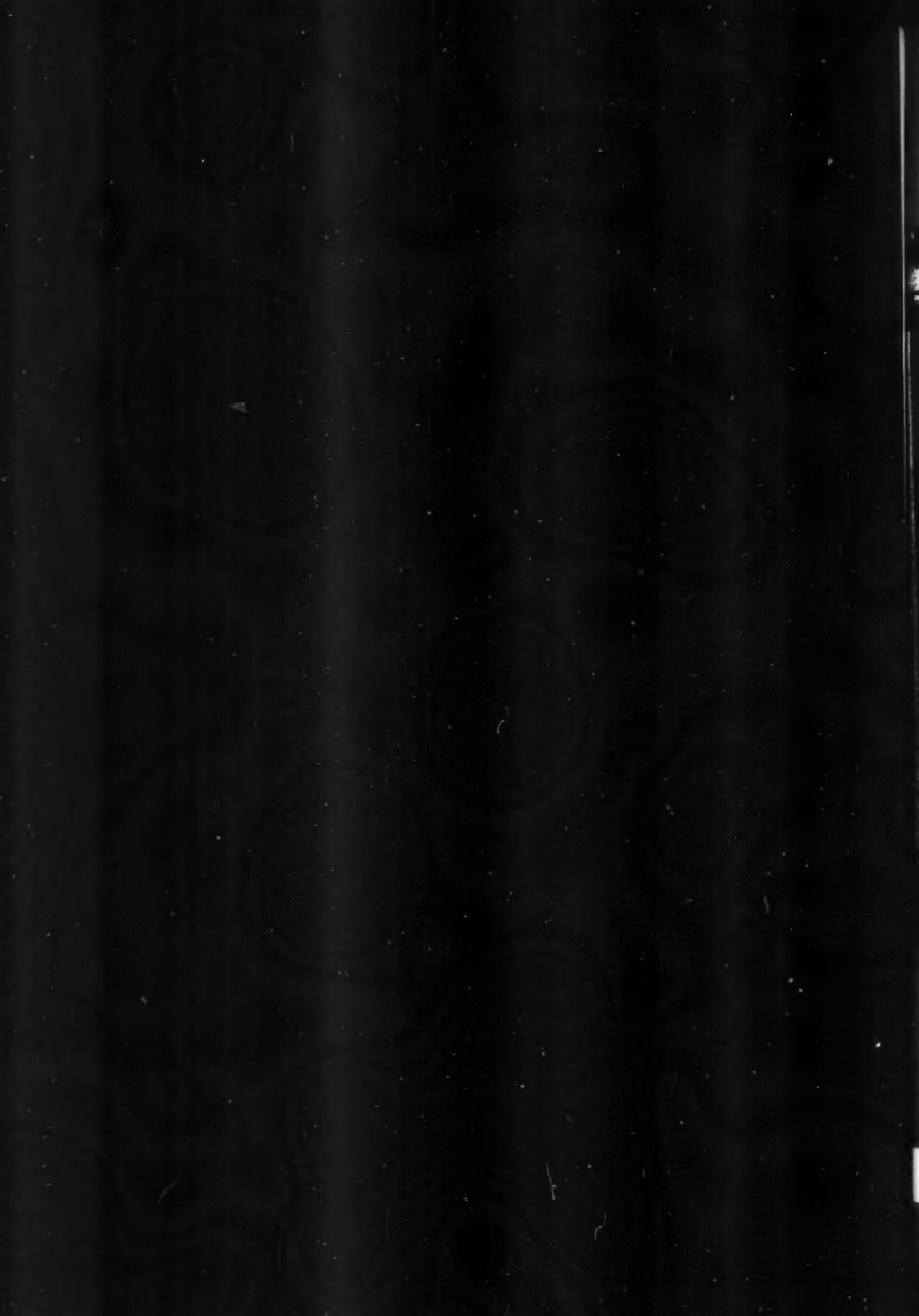
In Fig. 5 is shown the front of one swaging press. Blanks taken from the chute from the supply hopper are stacked by hand above a hole in an automatic sliding feed that shifts them into swaging position against a stop at the rate of about 18 pieces a minute. At the end of the supply chute, blanks pass through a bath of lubricant which is a mixture of kerosene, Cresol and lard oil. Fig. 6 is a rear view of the swaging press setup and shows part of the feed slide and ejector mechanism and of that which operates the locating stop which is automatically retracted before the die closes.

From the swaging die, the ejected workpieces are transferred by conveyor to a Ransohoff washing machine and are then fed into another hopper. This hopper supplies two presses that size the work pieces. One of these is a 400-ton HPM hydraulic press and the other a 600-ton Bliss knuckle joint press which is not used to its load capacity. Both presses are fed by hand along a slide so arranged that each piece pushes the prior one into position. Feeding is done through a hole in a guard that keeps hands and fingers well away from the die.

The purpose of the sizing operation is to make the flange  $\frac{1}{4}$  in. thick where  
(Turn to page 74, please)







ADD FLEXIBILITY TO YOUR SURFACE GRINDERS WITH

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## PRECISION SPINDLES



Ex-Cell-O 1 horsepower, 3600 rpm inbuilt motor spindle for surface grinder. Spindle swivels vertically, is used for sharpening cutters and broaches.

Standard horizontal Ex-Cell-O Precision Spindle with 1 horsepower, 3600 rpm inbuilt motor for surface grinders. Standard Ex-Cell-O belt-driven spindles also are available for this type of grinder.

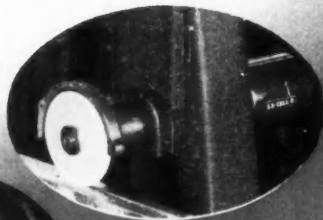
This Ex-Cell-O High Speed Attachment drives small wheels at 18,000 rpm. It is driven by the standard motorized spindle and is supported by the standard spindle or spindle bracket.

You can add to the flexibility of your surface grinders, and perhaps save the cost of another machine, with Ex-Cell-O spindle equipment. For instance the large photo at left shows an inbuilt motor spindle that swivels vertically. It makes a standard surface grinder suitable for sharpening cutters and broaches. A mounting member extends through bore in column that ordinarily houses the standard horizontal spindle.

The Ex-Cell-O High Speed Attachment also adds to the flexibility of surface grinders. This attachment mounts on the standard horizontal spindle or spindle bracket. The standard surface grinding wheel is replaced by a pulley that, through a flat belt, drives the high speed spindle at 18,000 rpm. Thus, small wheels can be driven at an efficient speed for grinding small shoulders, slots and other hard-to-reach places.

For rigid, smooth-running spindles that require no further lubrication or adjustment, and produce fine work day after day, contact your Ex-Cell-O representative or write to Ex-Cell-O Corporation in Detroit.

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not already of this thickness, at the same time giving it the final shape required. In addition, the thickness of the body at the boss is made  $0.530 \pm 0.002$  in. To effect this sizing, the die and punch are ground to a specified contour, certain portions of its faces being tapered about 0.004 in. to yield the desired final shape.

Workpieces are fed into the die by an air-operated slide. As the punch requires only a very small motion, it is not fastened to the ram of the press but is raised by springs just enough to permit workpieces to be fed in longitudinally between the die halves. Each workpiece is centered from side to side

by bowed springs formed from strip stock and made to clip inside the die, one pressing against each edge of the boss as the workpiece is shifted into place between the springs, acting as guides. This prevents the piece from shifting until it is gripped by the die as it closes when the ram presses the punch or upper die half downward.

Sizing completes press operations on the piece, but its central hole has to be drilled out and tapped. This work is done in the Globe tapper to which machine the workpieces are fed two at a time and move successively to drilling and tapping positions in two lines,  $\frac{1}{8}$ -in., 24-pitch threads being produced.

Workpieces drop from the machine onto a conveyor and are carried through a washer and then to the inspection station.

At each inspection station there is a rocking fixture having a cylindrical surface that fits the arc of the flange when the workpiece is laid thereon. Above the fixture and separately supported is a dial gage the end of whose plunger rests on the upper side of the flange. It is a simple and rapid operation to move the workpiece longitudinally and to rock the fixture so that the stem of the indicator moves around the flange. In so doing the indicator shows whether the flange thickness is within specified limits at all points. Boss thickness is similarly checked.

By following the production methods here outlined, high output and economy are attained. Although the number of operations, tooling and equipment required exceed those for pole shoes cut from special rolled stock, the resulting economies and superior performance realized in the end product more than justify the procedures for reasons already explained. Advantages are so much worth while that similar production methods are being extended to pole shoes for generators of other sizes than that using the particular shoes here described.

## THE RIGHT BALL



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## Pesco Plant

(Continued from page 33)

fit in the cover, against the gear faces.

A similar channel carries to the pump inlet the fluid which has passed through the bearing lubricating grooves and bearing seal rings. Pressure loading may be recognized as a positive means of producing extremely high pressures in a pump of relatively small size and weight.

In the schematic drawing shown here, outlet pressure fluid is led into the channels at the right hand side in the side view and directed against the rear faces of the bearings. This is effective in producing practically zero clearance between the bearings and gears, despite the fact that bearings are fitted with a running clearance.

This principle, therefore, assures maximum operating efficiency at high pressures but without the complications incident to a design in which clearance may be held by mechanical means. Moreover, it makes possible a relatively simple mechanical design from the standpoint of manufacturing and assembly.

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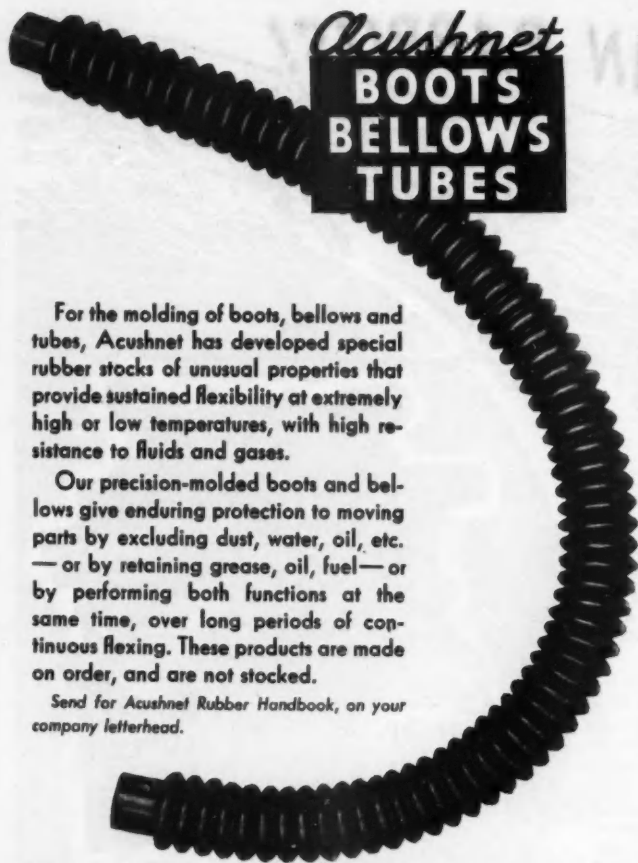


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## CALENDAR

OF COMING SHOWS AND MEETINGS

### Conventions and Meetings

SAE Annual Mfg. & Engineering Display, Detroit	Jan. 8-12
Nat'l Assoc. Engine & Boat Mfrs.	
Nat'l Motor Boat Show, New York City	Jan. 12-20
Plant Maint. Show & Conf., Cleveland	Jan. 15-18
Soc. of Plastic Engrs., New York City	Jan. 18-20
Truck-Trailer Mfrs. Assn. Annual Convention	Jan. 21-23
4th Annual Hot Rod and Motor Sports Show, Los Angeles	Jan. 25-28
Inst. of the Aeronautical Sciences, New York City	Jan. 29-31
Nat'l Auto. Accessory Mfrs. Assoc., New York	Feb. 5-8
Los Angeles Motor Car Dealer Assn., 29th Automobile Show, Los Angeles	Feb. 16-25
SAE Passenger Car Body & Materials Mtg., Detroit	Mar. 6-8
International Auto Salon, Geneva, Switzerland	Mar. 8-18
Amer. Soc. Tool Engrs., New York City	Mar. 17
Western Metal Exposition and Congress, Oakland, Calif.	Mar. 19-23
Pacific Automotive Show, Seattle	Mar. 21-24
Salone Internazionale Dell'Automobile, Turin, Italy	Apr. 4-15
British Automobile and Motor Cycle Show, New York City	Apr. 15-23
Amer. Soc. Lubricating Engrs., Phila.	Apr. 16-18
Amer. Mgt. Assoc., Nat'l Packaging Expos., Atlantic City	Apr. 17-20
1951 Metal Powder Show and 7th Annual Meeting of Metal Powder Assn., Cleveland, Ohio	Apr. 25-26
Chamber of Commerce Annual Mtg., Washington, D. C.	Apr. 30-May 2
Materials Handling Conference, Chicago	Apr. 30-May 4
A.E.R.A. Convention, Chicago	May 7-9
Nat'l Air Races, Cleveland Airport	May 19-20
Amer. Society for Quality Control, Cleveland	May 22-24
Third World Petroleum Congress, The Hague, Scheveningen, Holland	May 28-June 6
American Gear Manufacturers Assn. (Annual Meeting), Hot Springs, Va.	June 4-6
American Society of Mechanical Engineers semi-annual meeting, Toronto, Canada	June 11-15
American Society for Testing Mat'ls Annual Meeting, Atlantic City, N. J.	June 18-22

## BOOKS...

**BIBLIOGRAPHY ON NON-METALLIC BEARINGS**, published by *Engineering Societies Library*, 29 West 33 Street, New York 18, N. Y. An annotated bibliography of 101 selected references to the literature of the past 12 years which covers all aspects of non-metallic bearings such as their manufacture, design, properties, wear, lubrication, performance, testing and applications. It pertains particularly to bearings made of rubber, wood, laminated phenolic plastics, resin-impregnated cotton fabric, mica and nylon. Applications discussed are for rolling mills, marine propeller shafts and rudder posts, automatic presses, axle bearings for railroad rolling stocks, agricultural machines, etc.



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- **Prevents Accidental Opening or Closing of Contacts**—Seesaw balance of clapper prevents accidental opening—kick-out spring prevents accidental closing.
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**Westinghouse**  
**Life-Line**



**TOMORROW'S STARTER—TODAY!**

## Huge Hydraulic Presses for Aircraft Parts

(Continued from page 51)

ton capacity. In addition there are to be installed one 50,000-ton vertical closed die forging press and one 20,000-ton horizontal extrusion press of American manufacture. This plant is a proving ground for the development of techniques and the determination of the practicability of ideas and theories, whether submitted by industry or an individual. It is not intended that it will be a production plant, except in an emergency, or if the capacity is unavailable in industry.

Projects processed here are not

limited to the forging of light metals but may include all methods and materials processes wherein it is believed that improved results may be obtained by the use of great pressures and heat. Having horizontal extrusion presses now and vertical hydraulic presses in operation, supported by high and low temperature furnaces, the plant can be very flexible.

The costs for use of the equipment are limited to a nominal use charge for the equipment, engineering services; a proportionate share of the utilities and

the operational labor cost.

Erection of the 15,000-ton and smaller presses from Germany now going on, in addition to the extrusion presses already at the plant, will complete the first phase in setting up the Adrian plant as a proving ground for manufacturing methods. Meanwhile, it has become evident that airframe components are growing much larger; many are already beyond the capacity of the 18,000-ton press at the Wyman-Gordon plant; therefore, it was considered advisable to evaluate the possibilities of very large hydraulic presses.

Information received from Wyman-Gordon indicates that during the past year, many inquiries had to be returned because the sizes of the desired parts greatly exceeded the capacity of the press. In some instances, it was possible to make the desired part from two forgings. Notwithstanding the cost of extra dies, considerable savings were accomplished.

The National Security Resources Board began its exploration of the facilities and requirements in the area of power press manufacturing facilities and equipment shortly after its formation. A survey was begun in 1948 of the power press building industry and of anticipated requirements for mechanical and hydraulic power press equipment, etc. in the event of war.

The Munitions Board favorably endorsed the design and procurement of equipment and auxiliary items in connection with 12 die forging presses varying in capacity from 18,000 tons to 75,000 tons and 13 extrusion presses varying in capacity from 8000 tons to 25,000 tons.

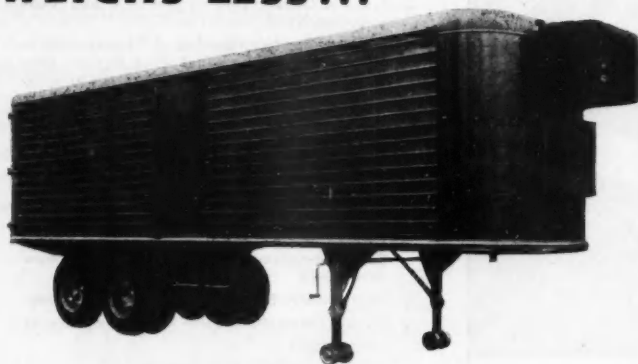
The Air Force then was called upon by the Munitions Board to formulate the entire program for these presses up to and including the bringing into being of all of the presses and having them in operation within a two-year period.

The use of forgings in aircraft becomes a very important element in mobilization planning for the following reasons:

1. Parts not requiring the full pressure of the presses can be produced in multiple cavity dies, thus producing large quantities of forgings in time of emergency.
2. It is also possible to place several dies for different parts in the press. By this method, parts of various designs can be produced by simultaneous action.
3. Greater strength can be obtained in parts of less weight, a factor of great importance to the aircraft designed of high performance aircraft.
4. A great reduction will be effected in manhours due to less machining and assembling time.
5. There will also be a great reduction in the demand for critical materials.

(Turn to page 80, please)

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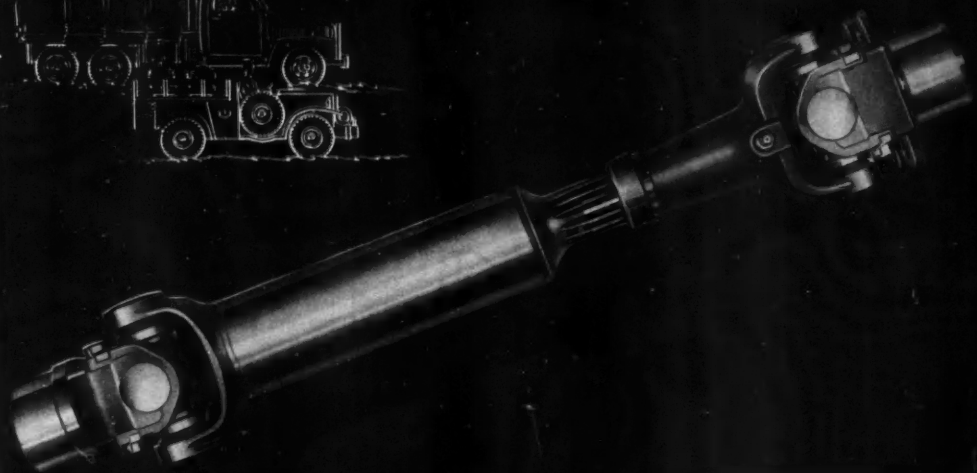
To provide extra payload capacity, aluminum construction is substituted for "dead-weight" on Lufkin Trailer Vans. And for extra stamina—to withstand the strain of hauling bigger loads—Lufkins are equipped with Tuthill Alloy Steel Springs! Whether you want to convert a 1½, 2, 2½ or 3-ton truck into a 6-wheel, heavy-highway hauler . . . whether you operate power shovels, overland buses or third-axle heavy jobs . . . Tuthill Alloy Steel Springs are designed and engineered to fit your specific needs!



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rials when machining a forging in lieu of machining from slab stock.

6. Fewer general purpose and special machine tools and obviously less floor space will be required in the fabricating plant.

Since large presses are vital to our production preparedness and must be gotten under way at once because of the time period required to design, build and place them in use, the following planned action is contemplated: There will be built at once an initial 75,000-ton closed die forging press and a 25,000-ton horizontal extrusion press; also intermediate 60,000, 35,000 and 18,000-ton closed die forging presses and horizontal extrusion presses of 8000 to 20,000-ton capacity.

The major use of these colossal forging presses will be to forge major structural members of small fast planes and to forge both major and secondary structural members of the very large planes. It has been clearly demonstrated in the discussions with aircraft engineers that our capacity to produce these large forgings will improve the strength and endurance properties of these vital structural members, reduce weight and cost of the planes and save large amounts of critical materials and labor. While not yet as thoroughly demonstrated, but possibly of even greater importance, is the anticipated integral structure and skin forging for more efficient and economical thin wing and stabilizer structures. Such forged surfaces promise supersonic structures superior to those yet attainable.

Further use of the initial presses will be made for large forging and forming operations in steel for items of ordnance, naval equipment and Engineer Corps equipment, in addition to the airborne items. Coincidentally, the tooling of the presses for rubber die forming will also permit the exploration of potential forming of large wing fairings and other aircraft sheet parts.

The above article is an abstract of a paper presented by General Wolfe at a recent meeting of the Detroit Section of the SAE in Adrian, Mich.

## Publications Available

(Continued from page 64)

and development of "Duco" finishes is told for the first time in a new booklet. Called "This is Du Pont—The Story of 'Duco' Finishes," it is a picture story of the discovery and development of modern finishes and the far-reaching effect on industry and American living today.

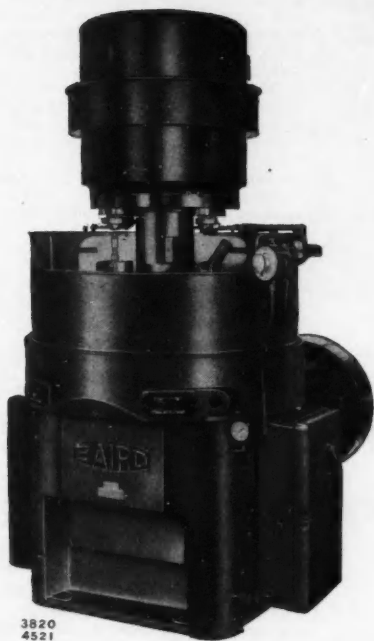
### A-11 Belts

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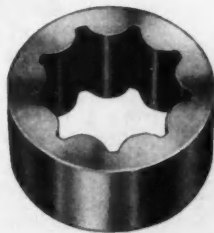
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The turret, carrying 4 work spindles and 4 sets of tool bars, rotates at 32 seconds per cycle. Thus, one part every 8 seconds . . . 450 pieces per hour. Stock removal is approximately .012" on O.D. and .010" on faces.

Photograph at right shows actual size of pump rotor. See above for operations performed.



The turret is driven through worm and gears . . . spindles mounted in roller bearing and driven by helical gears. Changes in all speeds are easy and inexpensive. Control stations are within easy reach, the spindle control at left; control at right for turret and tool arms . . . protected to

prevent feed of tools to work unless spindles are revolving. All electrical equipment is enclosed, with wiring concealed. The Baird 54 Vertical Lathe is a most versatile machine . . . and a profitable one for work within its range . . . so "ask Baird about it."

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# Two New Gear Materials

(Continued from page 45)

most alloy steels. If notch toughness is not of great importance the preliminary quench and temper may be replaced by a normalize and draw. Static strength properties after aging are not appreciably impaired. A third suggested treatment might involve complete annealing to produce a very soft prior structure for maximum machinability. Moderate strength would result by aging directly from this softened condition, and notched properties

would, of course, be relatively low but perhaps satisfactory for many purposes.

Maximum machinability plus maximum properties can be achieved by a combination of treatments, when the added cost of such treatments is justified. This might involve full annealing, rough machining, quenching and tempering, finish machining and aging.

And, finally, the material may incorporate a nitriding cycle as its final

aging treatment, from which a surface hardness of about 950 Vickers results, with a total case depth of about 0.02 in. In such instance the excellent wear resistance of the nitrided case is added to the heavy duty properties of the core.

The second material which I intend to discuss is something which can properly be labeled new, a development which reached fruition in the postwar period, and concerning which there is still a great deal to learn from the rough school of practical experience. I refer to ductile iron, the magnesium-containing gray cast iron in which the graphite is disposed as spheroidal particles instead of the more customary flakes. Fig. 2 illustrates this better than it can be described in words. The whole story is contained in those spheroids of graphite, which by their shape permit the material to realize a measure of the potential ductility and toughness of which its steel matrix is capable.

The set of proposed specifications contained in Table 5 indicates that four types of ductile iron are commercially available. The first is a pearlitic type, supplied generally in the as-cast condition, in which emphasis is on high strength and wear resistance with just enough ductility to provide some measure of plastic deformation under conditions of over-load. The second grade, a pearlitic - ferritic type, sacrifices strength in favor of more ductility. It is also generally furnished as-cast. The third type is a fully annealed, ferritic iron in which not less than 15 per cent elongation is readily obtainable, and in which yield strength remains at a respectable 45,000 psi minimum with 60,000 psi minimum tensile strength. The fourth is a rather special grade similar in strength level to the second, but in which elongation is not generally specified, although it runs about one to three per cent. This iron tolerates a higher phosphorus level, which reduces its ductility and toughness.

These are by no means the only grades of ductile iron available, but are the ones most widely produced. Other combinations of strength and ductility can be readily achieved, generally according to the relationship established in Fig. 3. Some of these will be illustrated by subsequent data.

A fortunate characteristic of ductile iron is its relative insensitivity to changes in section size. In the as-cast condition, strength and hardness decrease as the section is increased from one to six in., but this drop is not as severe as would be expected of flake graphite gray iron. In the annealed condition strength holds up well in the heavy sections and is uniform throughout the cross-section. Elongation values suffer appreciable drop. The investigation (Turn to page 84, please)



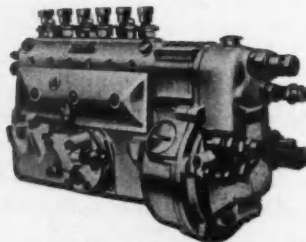
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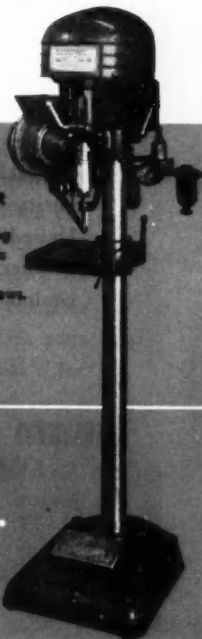
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tors attribute this to an inability to anneal the material to produce a completely ferritic structure in the cores of heavy sections. This problem scarcely appears to be insurmountable and is being studied.

Compressive strength might be considered a subject for some speculation, dealing as we are with a material that partakes of characteristics of both gray iron and steel. The ultimate compressive strength of gray iron is very high in proportion to its tensile strength; a ratio of  $3\frac{1}{2}$  or 4 to 1 is the general rule. The compression characteristics of ductile iron, as might be predicted, are neither as high in relation to tensile properties as those of gray iron, nor as low as those of steel.

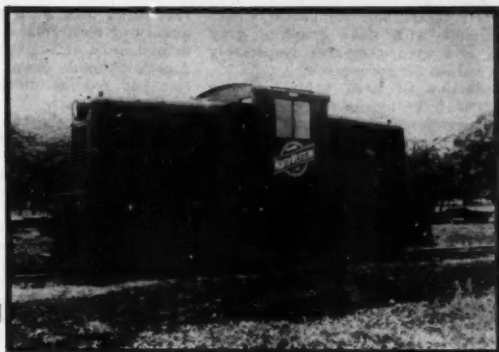
Ductile iron has a modulus of elasticity of about 25,000,000 psi. This value is somewhat less than the 29 to 30,000,000 psi generally attributed to steel, but represents a considerable improvement over gray iron, which does not follow Hooke's law. Ductile iron is truly elastic in the accepted sense and its modulus is practically unaffected by composition or section thickness. A comparison of the elastic characteristics of ductile iron and gray iron is provided by Fig. 4. The curve for spheroidal iron displays the shape attributed also to steel, with true proportionality giving way to a rounded yielding at high stress. Gray iron deviates continuously from a straight line and it is necessary, for engineering purposes, to measure a tangent to the stress-strain curve at some arbitrarily selected point, generally 25 per cent of the tensile strength.

Another elastic characteristic of interest is damping capacity. Ductile iron has much better damping capacity than the steel, although not so good as gray iron of low strength.

When tested in the form of polished bars, ductile iron has an endurance limit which is in the same proportion to its tensile strength as gray iron. It is somewhat inferior to the steel in this respect, which not only has a higher endurance limit but also a higher ratio of endurance limit to tensile strength. Frankly, these results are not very meaningful to the engineer, because he is rarely faced with a service application so exquisitely polished and streamlined in contour as a properly prepared unnotched fatigue specimen. He is generally dealing with rougher surfaces and irregular shapes into which he perforates cuts grooves or keyways to suit his various purposes.

For instance, the values for notched endurance limits in Table 6 show a considerably different picture than the tests on polished specimens. All three materials (forged steel, Meehanite, and ductile cast iron) suffer from the effect of the notch. But forged steel, with a relatively high notch sensitivity, suffers most, to such an extent that its ability to carry a repeated load indefinitely is less than that of ductile iron. The latter suffers the effect of a notch to (Turn to page 86, please)





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the same extent as the high test gray iron, but the higher strength level of the spheroidal iron permits it to retain a definite advantage over the gray iron. Ductile iron is accordingly the best of the lot under these conditions of test. This is a superiority that might be taken advantage of in the factor of safety used for design purposes.

The words "ductility" and "toughness" are often employed in connection with spheroidal cast iron. Elongation values accompanying tensile strength figures are appreciable, to the extent that for annealed ductile iron a minimum of 15 per cent can be safely specified. This, of course, far exceeds the

scarcely measurable elongation values obtainable with flake graphite gray iron, and even compares respectably with values for some steels.

Reduction of area values, also a product of the tensile test, are practically zero for gray cast iron, but are a commonly used gage for steel. Such values for ductile iron are indifferently poor, and are generally not reported. They run about equal to the values for elongation. The apparent anomaly between good elongation values and low values for reduction of area can be resolved when it is realized that reduction of area is sensitive to the presence and distribution of inclusions, being in

fact often used as a measure of the quality of steel rather than its ability to withstand deformation. Ductile iron does not "neck down" in the tensile test but reduces uniformly over the length of the bar.

The term "toughness" means something else again. A material may be ductile, in the sense that it can be bent, twisted or shaped readily, and yet lacking in toughness in the sense that it resists shock or the application of multi-directional stresses. Gray cast iron has never been considered to have appreciable toughness, but cast iron metallurgists have recognized the desirability of differentiating among the abilities of various irons to resist the application of a sharp blow. A modification of the Izod test is often used, employing an unnotched and un-machined arbitration bar 1.20 inches in diameter gripped in the Izod vise and struck three in. above the support by a swinging hammer with a striking energy of 120 ft lb. Using this test, comparison is made in Fig. 5 of flake graphite gray irons with several irons containing spheroidal graphite over the range from room temperature down to -300 F. The superiority of ductile iron is obvious and certainly from the cast iron standpoint the material has fairly good toughness.

The steel metallurgist, however, uses a much more severe impact test, such as the vee-notched or keyhole-notched Charpy test. On the basis of the vee-notched Charpy test, ductile iron in the as-cast condition at a hardness of about 250-270 Brinell yields values ranging from about two to four ft lb; in the annealed condition these values are considerably improved, ranging from about nine to 12 ft lb. Variations in chemical composition appear to have little effect.

Unnotched Charpy tests show that these values for four irons, ranging from 31 to 84 at room temperature and 16 to 52 at minus 40 F compare reasonably with values for such steel products as road scraper blades, commonly used in the rolled condition and which often are required to withstand shock in service.

A property which is always of vital importance in a gear material is its resistance to wear or to scoring or galling. Laboratory test data have been developed by means of ductile iron specimens shaped like brake shoes, pressing against a standard gray iron drum 3.5 inches in diameter and rotating at 1750 rpm. A five-pound load was maintained between specimen and drum for the duration of the test, which was 1 hour. No lubrication was used and wear is reported as milligrams of weight loss. Results on five specimens representing three heats were as indicated in Table 7. Specimens 1 and 5 were softer than the other irons; they ranged from 95-100 Rockwell B and 98-101 Rockwell B respectively. The hardness of the other specimens were in the range 101 to 106. It is interesting—

(Turn to page 88, please)

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## Is your motor really dripproof?

MOUNTED LIKE THIS ...



OR THIS ...



OR THIS?



### ... AT ANY ANGLE OF MOUNTING—

Do you see a ventilating opening in the frame? Then the motor is probably not dripproof when side wall or ceiling mounted. You need a special motor for these mounting positions . . . with special protection over frame openings. But . . .

You can save the costs of specials with Life-Line motors. Solid frame construction eliminates frame openings. All ventilation is accomplished through the end brackets. Simply rotate the 4-position brackets and the Life-Line is drip-proof—for side wall or ceiling mounting.

Drip-proof conduit box can be rotated also. Plenty of knockouts give maximum possible connections. And, because a Life-Line motor needs no further lubrication, you can crowd it into cramped quarters . . . mount it in "hard-to-get-at" locations—and forget it. Thus, you get maximum mounting flexibility for difficult mounting problems.

It costs no more to get these "special" features in a standard motor. Simply specify Life-Line as the drive for your equipment. Ask your local Westinghouse representative for details and a copy of booklet B-3842, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

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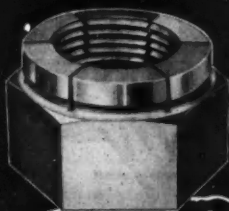
INDUSTRY'S LEADING MOTOR



# Why

## FLEXLOC

### SELF-LOCKING NUTS



"This nut will take the place of the two regular nuts and the washer that is now on this piece."

(Part of a letter from a Connecticut distributor.)

## ...simplify assembly

You can readily see why FLEXLOCs simplify assembly when you read the above excerpt from our distributor's letter. From comments like this we feel sure there must be hundreds of similar cases where FLEXLOC Self-Locking Nuts can be used to advantage.

FLEXLOCs offer these features: one-piece, all-metal construction—nothing to work loose or forget, no serious temperature

problems; resilient, automatic locking sections, processed by our patented method to make possible FLEXLOCs' closely controlled torques; PLUS the fact that the most chattering vibration won't loosen FLEXLOCs, even after many applications.

Why not convince yourself with actual samples? Tell us what size you want and you'll receive them promptly, together with our latest literature.



FLEXLOC Self-Locking Nut, "regular" type.



FLEXLOC Self-Locking Nut, "thin" type.



FLEXLOC Self-Locking Nut, external wrenching type.

**-SPS** STANDARD PRESSED STEEL CO.  
JENKINTOWN 53, PENNSYLVANIA

ing to note that the softer ductile irons wore at a greater rate than the others, but induced considerably less wear on the drum material. The company making these tests concluded on the basis of these results that ductile iron compares favorably in wear characteristics to the best open-grained gray iron made in statically cast pots for piston ring purposes.

Results of galling tests on ductile iron and gray cast iron demonstrate the fact that gray irons with coarse flake graphite are considerably more resistant to galling than iron containing fine, dendritic graphite. The ductile irons, of appreciably higher strength but not necessarily higher hardness, appear to show to about the same advantage as the A.F.S. Type A graphite irons when tested for galling.


Some limited investigation has been made of the flame hardening characteristics of ductile iron. Both as-cast and annealed materials were studied. The annealed material generally developed a lower surface hardness than the as-cast samples, but apparently is quite capable of meeting a range of 530-550 Brinell. The as-cast material developed 610 Brinell except in the case of the high-manganese iron, which developed 570 Brinell.

As observed at the start of this presentation, ductile iron is a new material. This discussion of its characteristics is not complete, but it comprises much of the known information available to data which might bear on its application for gears.

The data presented in general indicate that magnesium-containing cast iron is a material which partakes in fair measure of the better natures of both gray iron and cast steel. It is, of course, finding place as a replacement for existing materials in many parts; there appears to be no good reason why certain types of gears should not be represented on the list. But I think it would be short-sighted to view it simply as an improved replacement for existing materials. It is, after all, a material which can be as readily cast as gray iron, with no limitations on size. It has measurable ductility and can in many instances approach the properties of cast steels. These characteristics have already permitted commercial production of designs which hitherto existed only on drawing boards because, although they required properties commonly associated with steel they were too intricate to be cast in other than gray iron. Thus ductile iron can be utilized to redesign existing parts, and to create entirely new designs.

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*Regularly and Thoroughly*



**PICK 'EM RIGHT  
OUT OF THE BOOK....**

**...and  
still get  
"something  
special"**

Yes...you may select your required taps from a complete line of Hanson-Whitney *standard* styles and sizes and still get "something special."

And by "special" we do not mean extra-cost, made to specification taps. We mean standard extra quality "finished" taps...ground after hardening to give you the keenest cutting edges, the highest accuracy in lead, angle and diameter. All customary sizes in Hand Taps, Machine Screw, Nut, Tapper, National Hook, Pulley, and Pipe Taps are stocked for fast shipment in protective, clear-labeled, cartoned boxes. For maximum tap life and maintained accuracy, specify H-W.

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**PIONEERS OF FINISHED TAPS**



# Changes Can Be Controlled

(Continued from page 39)

## Effectivity is Determined

Another of the early actions taken by Change Control is that of determining or establishing the effectivity of the change. The term "effectivity" may indicate the total number of airplanes to receive the change, or it may refer to the number of airplanes to be handled by each method of incorporating the change. For clarity the former henceforth will be referred to as the "general effectivity" and the latter as

the "method effectivity." The general effectivity may be further divided into "service effectivity" indicating the number of delivered airplanes requiring service change, and "factory effectivity," or the number of airplanes changed before delivery. The general effectivity of customer-requested and mandatory changes is generally established by either the customer or the Engineering Department, respectively, but the determination of the division

between service and factory effectivity is usually a Change Control function. The general effectivity of non-mandatory changes may be established by either Engineering or Change Control, depending upon the nature of the change. In all such cases, however, Change Control checks the effectivity and will negotiate a different effectivity if in its judgment the urgency and need for the change do not warrant the effectivity set by Engineering.

Thus Change Control acts as a fact-finding board, obtaining all pertinent facts, such as the Engineering reasons for the change, the probability of failure or improper functioning of the airplanes without the change, etc.

## Shop Orders are Issued

Another action taken by Change Control while the change is still in the formative stage in Engineering is to consider the necessity for stop orders to prevent unnecessary manufacturing costs, and to recommend to Engineering what stop orders should be issued, and their effectivity.

## Engineering Release Date is Negotiated

Simultaneously with the establishment of the general and factory effectivity Change Control negotiates with Engineering for the release date of the change. It is here that the base point for all subsequent scheduling of the change is established, and it is therefore important that the optimum date be realistically established, and that Engineering makes a determined effort to meet it.

## Change Control Release Action

It has been seen that, during the pre-release period of a change, Change Control has had an opportunity to do a certain amount of preliminary planning. As soon as the release of the change E. O.'s begins, Change Control must act rapidly to establish officially the final course of action, obtain firm schedule commitments from all departments involved, determine the method effectivities, establish schedules to be followed in accomplishing the change, note the necessary scheduling and handling information on the E. O.'s, release them and write and publish the Change Schedule (described later).

In planning, scheduling and releasing a change, the change analyst's first step is to study the E. O.'s and drawings and become thoroughly familiar with all details of the change, determine what materials and parts will be required, what tooling will be affected or required and what manufacturing operations and departments will be involved.

He next determines availability of  
(Turn to page 92, please)

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**CHICAGO TAPPETS**



... For rugged engines  
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"So we ordered some 17/32" E-33 "E" Steel stock, set up our B&S #2 and B&S #0 Automatics and began to turn out parts. We had used B-1113 for this job before and had been getting 350 pieces per hour. But we soon realized we could machine much faster with "E" Steel, and we kept increasing speed until we were getting an average of 600 parts per hour. That's a 71%



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Get your copy of the booklet titled "A Progress Report on 'E' Steel." It outlines a series of 11 case histories from machine shops that have used "E" Steel with excellent results. Write for your copy.

\*Based on an actual case history.



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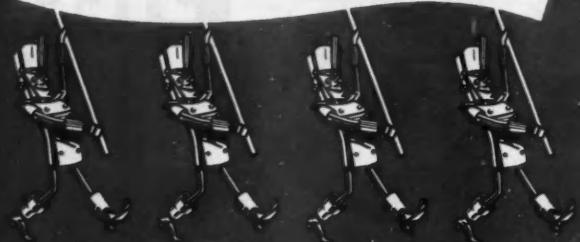
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## JONES & LAUGHLIN STEEL CORPORATION

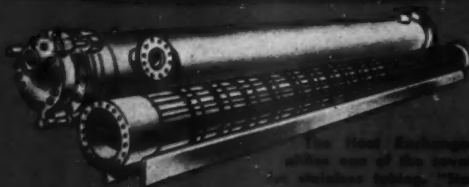
From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY and JALLOY (hi-tensile steels).

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material and parts. From a study of the basic airplane assembly schedules he determines the first airplane which can be changed in the normal assembly position. This airplane may be too late to be acceptable for the initial effectivity of the change. The Change Analyst must then resort to expedite methods of procurement, fabrication, and installation. It is here that he must decide what degree of urgency, and hence additional expense, is required to meet the desired or required effectivity.

### Change Control Meetings

Valuable assistance in determining the best methods to be used in accomplishing the change is obtained by discussing the problems with the proper Engineering, Materiel, Tooling, and Manufacturing personnel. This may be done by individual contact in the simpler changes, or at Change Control meetings for those changes requiring considerable coordination. At these meetings are representatives of all departments involved, authorized to make firm commitments for their departments.

### Half-Timing

If normal production methods cannot be utilized there are two expeditious methods available for parts fabrication. One is a simple speed-up of normal production channels, known as "half-timing." This method takes advantage of the fact that normal production timing is based on production quantities and allows for the usual manufacturing contingencies and hence provides as ample margin for most operations when considered for a few parts. Thus with special follow-up by supervision and production control, limited numbers of parts can be expedited through the usual production channels.

### Quick Fix Fabrication

If "half-timing" does not provide parts in time to meet the desired effectivity for the first airplanes, the final resort is to "Quick-Fix" fabrication, which enables parts to be fabricated by the fastest methods available, without benefit of production tooling and by short-cutting most of the normal production channels.

All Quick-Fix work is assigned to one department which is well equipped with top grade mechanics and metal smiths to make sheet metal parts and assemble by hand or with improvised tooling. This department does not necessarily do all the quick-fix work itself, but may act as a contractor who farms out jobs on an expedite basis to the production departments best suited to do the work. The Quick-Fix Department follows closely the progress of the work through the subcontracting departments and all phases of operations and processes.

Once the method of parts fabrication required to meet the desired effectivity (Turn to page 94, please)

# COMPLETE

# SYSTEMS

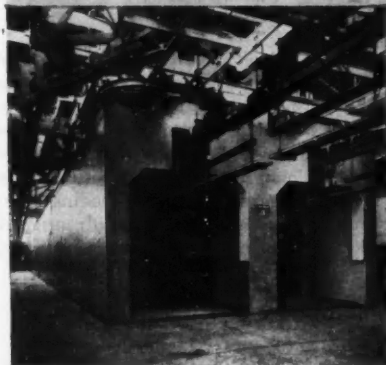
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Interior of the New Mahon Down-draft Hydro-Filter Spray Booth with the New "Hydraire" Flood Sheet.



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has been established, the means by which the parts are to be installed on the airplanes or, if no new parts are involved, how the airplanes may be reworked must be considered. Here again there is a choice of methods, depending upon the dates at which parts will be available, and the location of the airplanes along the production line. If parts are available soon enough, they can be installed by normal production methods "in line position." Even if they are a little too late to be used in the normal assembly or installation position, they may still be installed by the production department "out of position." If they are too late to catch the airplane in the proper production department the installation, or rework, is then assigned to the Quick-Fix department, whose experts can operate at almost any position of the airplane along the production line, although usually at specific positions assigned to them.

#### The E.O.'s are Released

With the plan of action established and the schedule dates committed, the Change Analyst is ready to prepare the E. O.'s for release. Each E. O. is noted as to the method of handling and the schedule to be followed. If adequate time is available to permit handling by normal production methods with all tool and shop order dates "future due" the E. O. is simply noted that it is to be handled per basic schedules, and is released into the normal release system (refer to Fig. 2).

If the schedule requirements are such that normal production facilities can be used but will require "half-timing," the E. O.'s are again noted to be handled per basic schedules, but are advance released to Planning (see Fig. 2). By virtue of the fact that the shop orders issued by Planning will carry basic schedule dates, Production Control and the shop will automatically handle them by "half-timing" if necessary to meet the dates, hence the change analyst's schedule requirements will be met. If it is determined that, even by "half-timing," normal production methods cannot be used, and Quick-Fix action is necessary, the number of parts to be fabricated by Quick-Fix is noted on the E. O. The number of airplanes requiring Quick-Fix installations or rework is also noted on the E. O., together with the positions or line locations at which the work is to be accomplished. Schedule dates for the first airplane are noted. The E. O. is then advance released to Planning, with copies issued directly to the Quick-Fix department so their work can start while the orders are being written.

The fact that all Change Control instructions have been noted on the E. O. in these illustrations is significant. The E. O. is authority for action on changes, hence all Change Control instructions and information as to methods of handling and schedules are noted on it.

As soon as the initial release of (Turn to page 96, please)

# WITTEK

## NOC-OUT HOSE CLAMPS

*The Standard  
of the Automotive  
Industry*



Type A—Radiator  
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Type G-BB—Booster  
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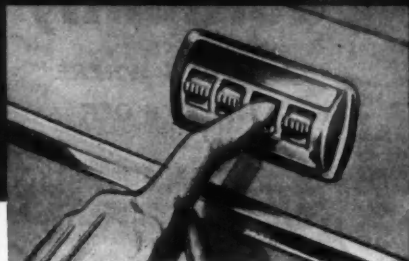
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Wittek Noc-Out Hose Clamps are designed in a variety of types made in many sizes for use by the automotive industry. Because they provide the most practical leakproof hose connection, they are specified by the leading manufacturers as standard, original equipment for automobiles, buses, trucks and tractors.

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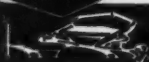
Simplicity of construction and dependability of operation make the Hydro-Lectric system first choice of automobile engineers.

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Convertible  
Tops



Hydro-Lectric  
Systems



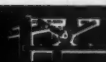
Power  
Mowers



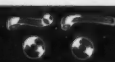
Side Delivery  
Rakes



Power  
Sweepers



Window Channels and  
Regulator Assemblies



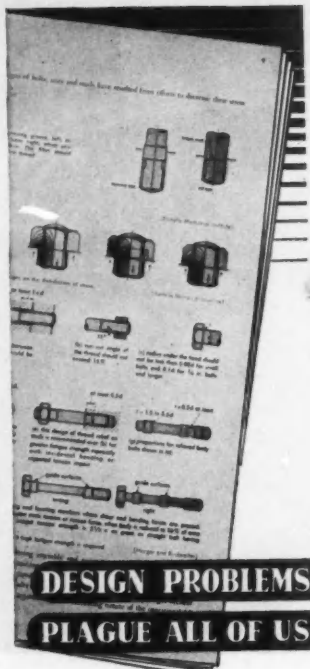
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AI-1

F2-4

E. O.'s on a change has been completed by the Change Analyst he prepares an informative memorandum called a Change Schedule. Copies of the Change Schedule are issued to all departments and persons involved or interested in the change. The Change Schedule briefly describes the change and the methods and departments involved in accomplishment of the change. The effectivities are noted, and the schedules for both the "Quick-Fix" and first production plane action are given. All E. O.'s released are listed. As additional E. O.'s are released, or as new phases of the change develop, the Change Schedule is revised and re-issued so all concerned may be kept up to date.

### Follow-up of Changes is Maintained

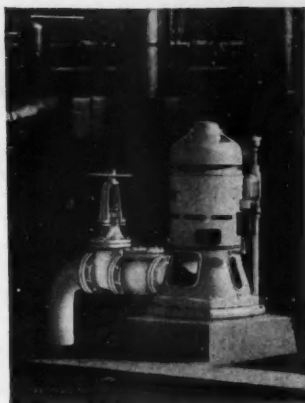
Change Control maintains an active follow-up of action on changes until the change is absorbed into the production system. This is done by continual checking with Materiel, Tooling and Production departments to determine when materials have been received and tools, fabricated parts and installations are complete for the first airplane on which the change is effective by normal production methods. Lists of materials, tools, and parts are compiled from the E. O.'s and the tooling and shop orders received from Planning. The status of all active changes is reported weekly by means of a "Change Schedule Status Report." This serves to advise supervision and responsible personnel of the progress of changes through their departments, and enables them to check and institute corrective action when necessary. The progress of "Quick-Fix" action is not so reported, since it happens so fast that to maintain a follow-up other than that maintained by the "Quick-Fix" department itself would be highly impractical. Once the change has been accomplished successfully on the first airplane by normal production methods it is considered to have completed its activity as a change and is of no further interest as such to Change Control.

The incorporation of changes at the rate required for modern military aircraft can be successfully accomplished without undue cost penalties or disruption of production schedules.

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It is the amazing durability of Layne well water systems that pays off for big petroleum refineries. They have a situation—as do most heavy water users—where a supply failure would stop everything. When they buy a Layne installation, they know that they are dealing with the world's most widely experienced well water developers;—an organization that knows what it takes to build smooth operating and long lasting systems. Layne has the kind of engineering skill and special equipment for doing the job complete, always delivering all and generally much more water than is promised by their contracts.

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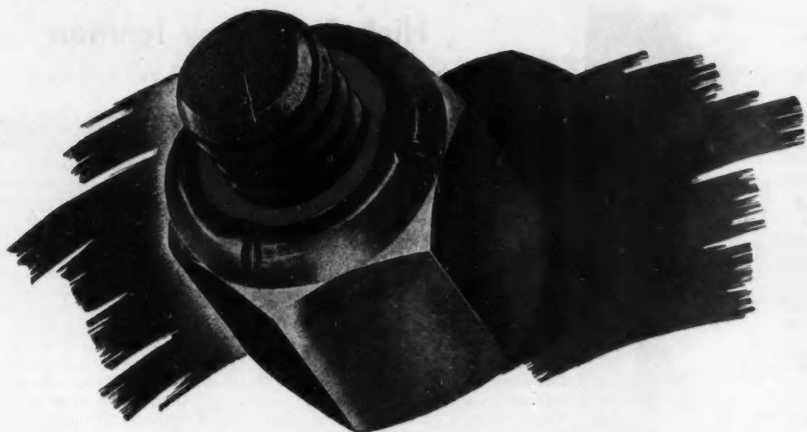
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...OR RELEASED IN AN INSTANT!

 The efficient Greer Self-Locking Nut solves many a tough engineering problem. So simple in principle... so easy to apply... **YET** so powerful in its unshakable locking grip! It's 100% secure, clamped and set against every conceivable vibration! *Best of all*, an ordinary wrench unclamps it again in an instant!

## VIBRATION TESTED FOR THOUSANDS OF HOURS

 Probably the toughest test of all for GREER Self-Locking Stop Nuts is on pneumatic drills. Here they pass thousands of grueling hours of violent vibration with flying colors... **NOT ONE** has shaken loose to our knowledge.

## GREER LOCK NUT MEETS THE ANA REQUIREMENTS

Where small but strong fastenings must be applied (and later removed)... are subjected to vibration and must stay **ABSOLUTELY TIGHT**... GREER Self-Locking Nuts have proved to be ideally suited.



# GREER

*Self-Locking Nuts*

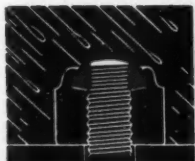
## GREERCOID COLLAR HAS DUAL ROLE!

Flexible but extremely tough... the Greercoid Built-In Lock has just the right resiliency to "soak up" any "shortwave oscillation" attempting to start between nut and bolt. It also serves as a powerful set-clamp and braking surface. Compression plus flexibility give it an unshakable grip and generate much added holding power in the lower threads also. Greer Stop Nuts are identified by the label on the carton. Meets ANA requirements.

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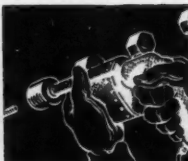
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**GREER STOP NUTS FOR APPLICATION IN ALL INDUSTRIES**



### SEALED

Protects working threads.



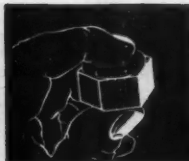
### FASTER ON

Tighten, and it's on to stay!



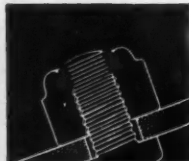
### FASTER OFF

Ordinary wrench does it!



### RE-USABLE

Use them again and again!



### NO PLAY

Keeps threads tight.

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**TEST FIXTURES**  
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## High Frequency Ignition

(Continued from page 36)

shortening of high tension lead lengths have helped to extend this maximum voltage point, but these changes are rapidly reaching practical limits. Present indications are that the only alternative in this direction for conventional ignition systems is toward a twelve volt storage battery source.

The sparking voltage output of a high-frequency ignition system can be adjusted between the limits of available flashover distances, strength of dielectric materials used and the output capabilities of the power supply. The discharge capacitor voltage level, or the capacitor size can be increased for high output voltages. This necessitates only the proper proportioning of the output voltage and power of the power supply. All anticipated spark voltages are attainable from a six volt battery.

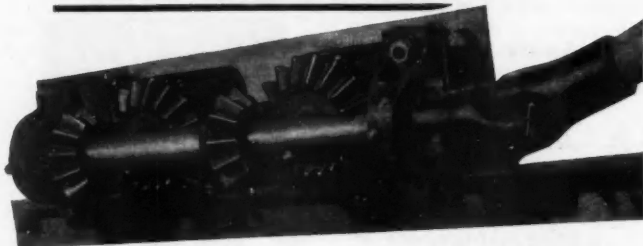
**Radio Noise**—Radiated interference affecting home radios and television sets from a high-frequency ignition system is not objectionable because of the localizing of high voltage components to the distributor housing, and the small energy contained in each spark discharge. However, conducted interference being carried through the automobile wiring system to the automobile

radio is severe because the fundamental frequency of the spark discharge falls in the broadcast spectrum. This requires the use of a specially constructed network type filter in the battery lead to the power supply which has its peak attenuation in the broadcast frequencies.

**Life**—The most vulnerable parts of the high-frequency ignition system being discussed are the power supply vibrator and the discharge capacitor. Manufacturers estimate a minimum average life of 1500 hours for vibrators similar to the type intended for this application, which means a mileage life of 20,000 to 30,000 miles. However, the vibrator in this high-frequency system can be "plugged in" by any inexperienced motorist, and immediately operated without any further adjustments, in direct contrast to the installation difficulties encountered and adjustments necessary with conventional points.

For optimum performance, the discharge capacitor must be located close to the distributor housing with the consequence of being exposed to engine surface temperatures. Little experience (Turn to page 100, please)

## Gear Teeth **FORGED!**



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ALSO: production and precision cut and ground spurs, sprockets, helicals, worms and worm-gears; straight and spiral bevel gears and racks.

Precision FORGED-TOOTH gears eliminated failures of cast-tooth, cast-iron gears on the heavy duty material loader drive shown above. Costs were 50 per cent less than for commercially cut gears.

If you use gears for bevel differentials, farm machinery drives, construction and road machinery or similar slow speed applications, it will pay to investigate FORGED-TOOTH gears. Send blueprints or samples of gears you are now using for comparative application, performance and cost analysis.

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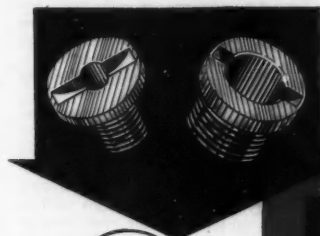
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Chicago 38, Illinois

# Bodine CASE HISTORY NO. 27

## PROCESSING 2 STEEL THREADED BUSHINGS



1

Hand load blanks to dial.

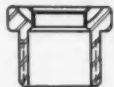
2

Automatically clamp (air cylinders).



3

Mill radial slot .100 wide x  $\frac{1}{16}$ " deep to close tolerances.



4

Ream and c'sink .385 dia. hole.

5

Automatically unclamp (air cylinders).

6

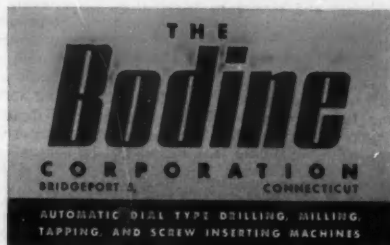
Automatically eject.



### PRODUCTION:

This Bodine No. 42-30 automatic dial type Milling and Drilling Machine is equipped with 2 fully adjustable ball bearing Milling Spindles and 2 adjustable ball bearing Drilling Spindles. Machine tooled to produce 2 similar components (as above) per stroke . . . 36 pieces per minute. If you can use Bodine machines, you'll be protected from competition.

"You can't meet  
Tomorrow's Competition  
with Yesterday's Machine Tools"





has been obtained with this particular application, but similar aircraft installations indicate that the discharge capacitor can be made capable of long periods of operation without deterioration.

The remainder of the power supply components can be expected to have long service life as the power supply section can be located in a relatively cool portion of the automotive chassis away from the engine. The transformer and selenium rectifiers can be hermetically sealed for additional reliability. The same is true for the rotating high-frequency transformer, as it is small and of simple construction. The primary distributor can be made adjustable for maintaining small clearances with the primary distributor ring. Secondary distributor and spark plug life are a function of the electrical energy in the spark discharge, which has been measured to be considerably less than in a conventional system. Reduced corona activity results from a reduction in the time duration of the spark discharge, thus providing for a long service life for high voltage wiring.

The preceding discussion has acquainted the reader with a new type of automotive ignition system which is intended to more adequately satisfy the performance requirements of modern engines than does the conventional present day ignition system. A frank admission is made that many of the points discussed under the high-frequency service life paragraph are not as yet backed up by proven fact. However, many of the statements made are based on considerable experience with similar equipment in the aircraft engine field. Furthermore, some additional experience has been gained with an operating system in a 1948 Nash "600" automobile. A brief description of this installation follows.

Fig. 4 is a photograph of the three working parts of a high-frequency system as built for service operation. The power supply is mounted on the firewall dash directly under the hood. The transformer distributor unit is an original piece of equipment modified to accommodate the high-frequency transformer. A bracket holds the discharge capacitor directly to the body of the distributor housing.

Fig. 5 is a cross sectional sketch indicating the general construction of the transformer-distributor unit. The rotating high-frequency transformer and primary and secondary distributors are an integral unit, and constructed for mounting in place of the conventional distributor rotor, with the cam and breaker plate of the original equipment left undisturbed. A spacer ring mounting the primary distributor electrodes is placed between the housing and the cap. Engine timing is accomplished by angularly displacing the transformer about the shaft until the primary finger is aligned in firing position with the proper primary electrode, and then locking with a friction grip.

To date, approximately 2000 miles have been driven with the above system. No opportunity has been available for comprehensive tests on the ignition system as part of an operating engine to establish its service performance, although the following observations are perhaps worthy of note. Engine idling characteristics are improved without any change in spark plug gap spacings. This may be due to the fact that at engine speeds of less than 550 rpm, each plug gets more than one spark discharge per engine cycle, for at low speeds the time required for the primary finger to pass an electrode is less than the period of the power supply vibrator. The above reason also contributes to the ease of starting evidenced with high-frequency ignition sparking the engine.

In some installations, it may be necessary to shift the ignition system timing to the engine from manufac-

turer's recommendations due to the rapid rate of voltage rise after capacitor discharge. Also, adoption of high-frequency ignition may require some re-scheduling of the centrifugal and vacuum advance mechanisms for optimum engine performance, as these mechanisms must then actuate an inertia load rather than the intermittent frictional drag load produced by cam and breaker operation.

It is hoped that this article has adequately pictured the possibilities inherent with the use of high-frequency ignition in modern automotive engines. The recent interest in this type of system being displayed by major airline operators emphasizes the fact that it should not be overlooked in the automotive industry. Perhaps, in some small manner, this article may stimulate the engine performance field of automotive engineering as has the automatic transmission spiked the vehicle drive field.

## Patent Suits

(Continued from page 47)

As supplier of the Electromatic clutch Bendix has assumed the defense in a separate suit and for the Packard overdrive Borg-Warner has assumed the defense.

In the Packard Ultramatic suit Specialty Equipment charges infringement of Patent No. 2,203,296, which deals with devices for the control and operation of hydraulic selector mechanisms, particularly for use in automobile transmissions. Gaston Fleischel, of Bleneau, France, as in the other suits, is named as the inventor. Application for this particular patent was made in France on May 7, 1936 and in the United States on April 27, 1937. It was granted here on June 4, 1940, which was at the time France was being overrun by the Nazi army. Because France was in the hands of the enemy the U. S. Alien Property Custodian seized the patent in 1942 and held it until 1947 when it was returned to Fleischel. The patent was assigned to the Specialty Equipment and Machinery Corp. on March 19, 1948, according to its patent attorneys.

One of the principal infringement claims in connection with this patent is said to be the use of a slidable valve having two pistons of different diameters with a fluid between them under pressure by which the operation of a clutch can be controlled. A diagrammatic sketch from the patent, illustrating such a setup, is shown here.

General Motors Corp. and the Chesapeake Cadillac-Oldsmobile Co. of Baltimore have been named defendants in the Hydra-Matic suit, which is scheduled to go to trial Feb. 5. Infringement claims are based on the foregoing patent and two other patents. In November the General Motors attorneys

made depositions in the Baltimore court, claiming that the patents are not valid and cited a number of patents and printed descriptions pertaining to such devices that have appeared before the Fleischel patents.

The suit filed against the Schwing Motor Co., Inc., of Baltimore, charges infringement of four Fleischel patents in parts of the Hudson Vacuumotive and Drive-Master units, including the overdrive when installed with them. The patents pertain to devices for control of automatic gear shifting mechanisms. Like other manufacturers, Hudson Motor Car Co. has intervened and will handle the defense in this case.

## Shortages of Aluminum

(Continued from page 48)

Even on pistons it is doubtful whether a substitution is feasible in the new V-8 engines. In-line sixes and eights are not particularly sensitive to increased reciprocating weight so far as primary balance is concerned. V-8's, on the other hand, are sensitive to reciprocating weight and any change in weight will require a corresponding change in the counterweighting of the crankshaft.

Of course, there are other aluminum parts in certain makes of cars. For one thing, Nash recently introduced an aluminum flywheel housing to replace cast iron. Similarly the Ford automatic drives have an aluminum housing extension. Presumably such parts could be replaced with cast iron at the expense of new tooling.



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## Communication System Operates on FM Carrier Current

**P**OSITIVE and instant two-way communication between ground stations and mobile or stationary stations in widespread locations in automotive plants is facilitated by Femco Trolleyphone and Femco wired audio systems produced by Farmers Engineering & Mfg. Co., Pittsburgh, Pa.

The Trolleyphone system is particularly effective in connecting cranes and ore bridges and coal unloading docks with remote ground stations because it operates on FM carrier current, utilizing existing power wiring. Hence it can be readily installed without the complication of introducing special con-

necting power lines. Each station consists of a trans-receiver unit, a resistor for lowering line voltage, loud-speaker, and press-to-talk microphone.

Several major installations have been in use in certain large automotive plants for the past year. One of the larger installations is found at Ford Motor Co., where a nine-station system is in use in the steel mill operation, connecting the control or scheduling stations with ore bridges, coal unloaders, and the Ford Hi-line. A five-station system also is in use for controlling the operation of the big cranes in the soaking-pit department of the steel mill, the cranes being instructed from two ground stations.

A Femco audio, four-station system is in operation in the Ford open-hearth department with the ground station in the "pulpit" or control gallery.

Prior to the installation of these Femco systems it was necessary to communicate with crane operators by hand signals. Positive station-to-station communication has combined to assure the instant relaying of instructions without any danger of misunderstanding.

Another outstanding application of Trolleyphone communication is found at the West Pullman Works of International Harvester Co. Here the system provides a positive and quick means of communication between fixed stations and cranes as well as among crane operators in scheduling and spotting delivery of raw materials to the machines in the screw machine plant.

### Engineering Firms Hold Mobilization Meeting

Anticipating increased demands for the services of independent engineering companies, the National Association of Engineering Companies (NAEC) held an industry mobilization meeting in Detroit recently. Keynote of the meeting in the words of H. L. Murray, president of NAEC, was "to educate themselves in the conduct of their businesses." Although membership is not large, the meeting drew an attendance of over 150 delegates and guests.

In keeping with the keynote of the meeting, four specialists presented papers of practical importance at the general forum. J. G. Sipe, chief procurement officer, Detroit Arsenal, talked at some length about government contract problems, recommended that

(Turn to page 104, please)

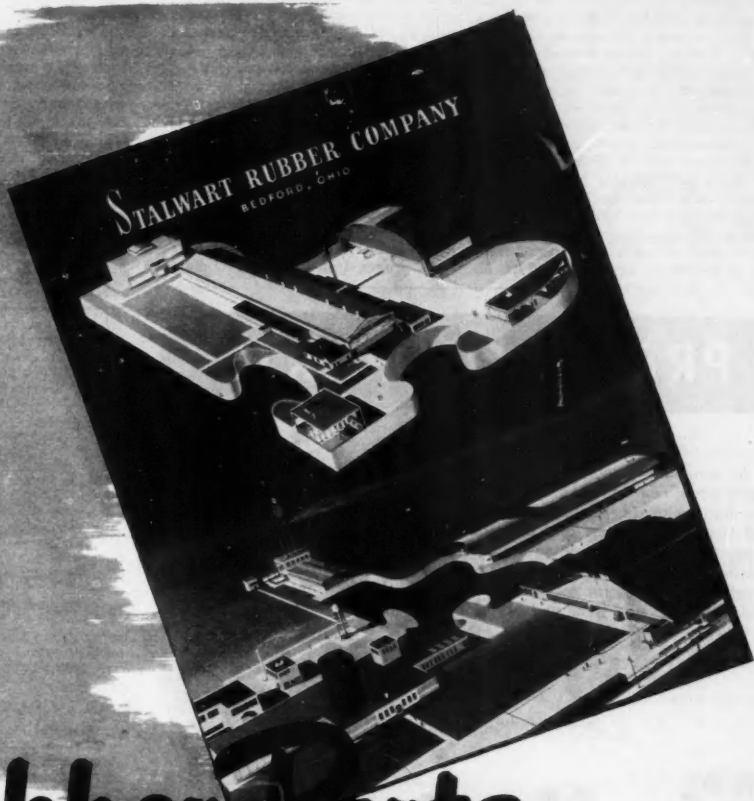
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NAEC set up committees to cooperate with government agencies on design and labor standards, ethical practices, and other matters of mutual interest. Robert Vartan, Price-Waterhouse & Co., dealt with accounting problems and accounting practices in connection with government contracts, emphasized the need for good record keeping. He recommended close study of the Renegotiation Act of 1948 (as amended) in view of certain basic changes differing from the ground rules in effect during the past war. Talks dealing with wages and hours and employment regulations were given by T. Hermansen, chief enforcement attorney, and O. K.

Fjetland, director, Michigan State Employment Service.

Principal speaker at the banquet session was H. L. Tigges, vice pres. Baker Bros., chairman, Machine Tool Industry Mobilization Group. Recently, Mr. Tigges was sworn in as part-time Machine Tool Consultant attached to NPA. However, his address on the subject of industrial mobilization was given, not in his official capacity but as chairman of the NTIM Group. In general, he discussed the role of NSRB in its overall planning of industrial mobilization, the formation of NPA and its functions at the present time. He stressed the need for a program of allocation of machine

tools equitably among civilian users and contractors on defense orders, assuming for the moment that the status quo of a "guns and butter" economy is still in effect. Under present conditions there still remains the problem of developing a workable system to assure an adequate supply of needed materials for machine tool builders to enable them to maintain a high level of production.

## BOOKS...

**FOUNDATIONS OF AERODYNAMICS**, by A. M. Kuethe and J. D. Schetzler, published by John Wiley & Sons. The aim of this textbook is to provide a complete perspective of the latest knowledge in the field of aerodynamics, giving a background useful in approaching problems in aeronautics as well as other fields. Based upon classroom notes used at the University of Michigan, the authors develop a unified treatment of perfect, viscous, and compressible fluids, designed for an understanding of flow processes. In considering perfect fluid flow, attention has been given to thin airfoil and finite wing theory; treatment of the compressible fluid theory includes one dimensional flow, flow around wings, and shock waves; Viscous fluid flow includes such matters as laminar and turbulent boundary layers, turbulence, and transition. Experimental results are compared with theory to explain phenomena for which theories are inadequate.

**DESIGN OF ELECTRICAL APPARATUS**, Third edition, by Joku H. Kuhlman and N. P. Tsang, published by John Wiley & Sons. Following the pattern of the previous editions, this text deals with DC generators and motors, AC generators and synchronous motors, induction motors, and transformers. For each type of apparatus the authors proceed first with an explanation of construction, then a presentation of formulas and procedure, followed by a review of design limits established by practice and specimen calculations. In presenting the latest edition the authors have revised design constants and limits in accordance with current practice, revised sample design calculations for DC machines in accordance with revised output constants, and changed the method of calculating field current for specified load and power factor for synchronous machines to agree with ASA procedure. The section on induction motor design has been largely rewritten with new methods for determining motor dimensions. Design of small transformers used in control circuits and for power supply in electronic devices has been included.

**ELECTRICAL ENGINEERS' HANDBOOK**, Volume II, Fourth Edition, by Pender and McIlwain, published by John Wiley & Sons. Volume II of Pender's well known handbook supplements the first section on Electric Power issued earlier this year. In the fourth edition the second volume deals entirely with electric communication and electronics, reflects an ever widening perspective in the electronics field. It is of interest that a total of some 78 specialists in their respective fields have contributed to the new edition.

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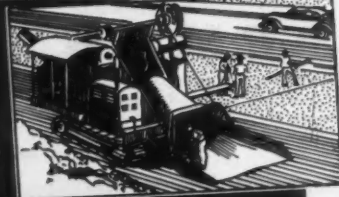
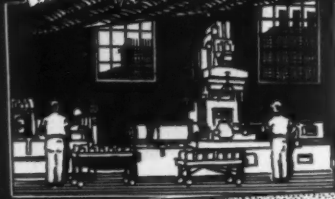
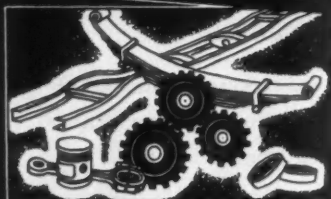
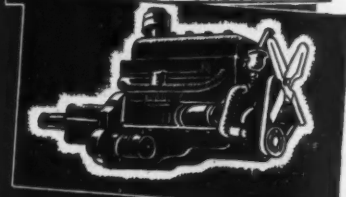
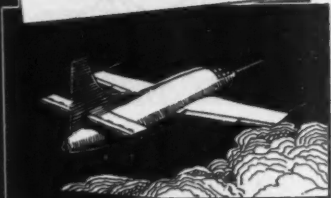
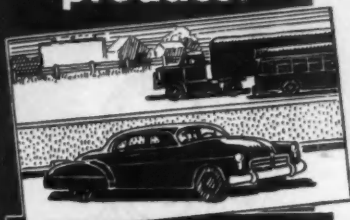
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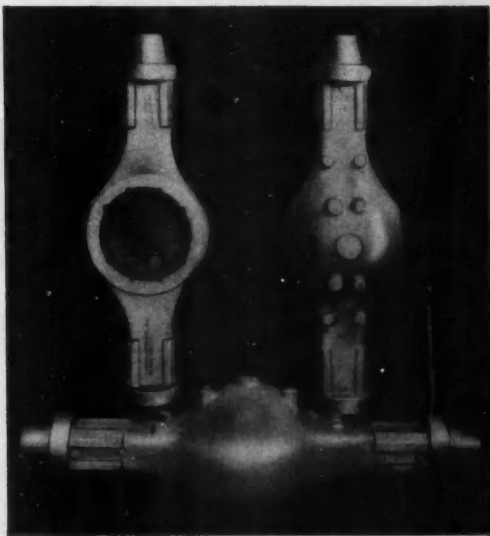
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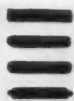


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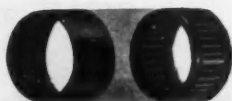
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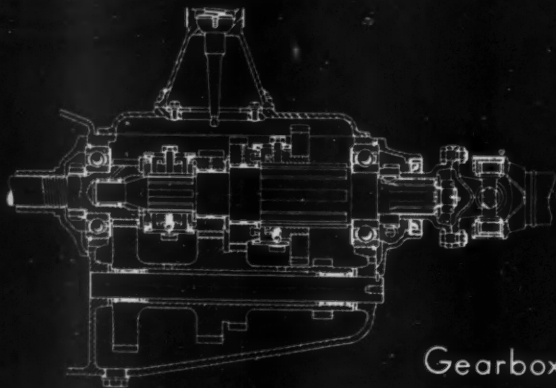
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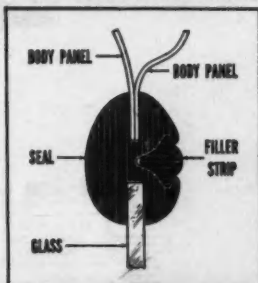
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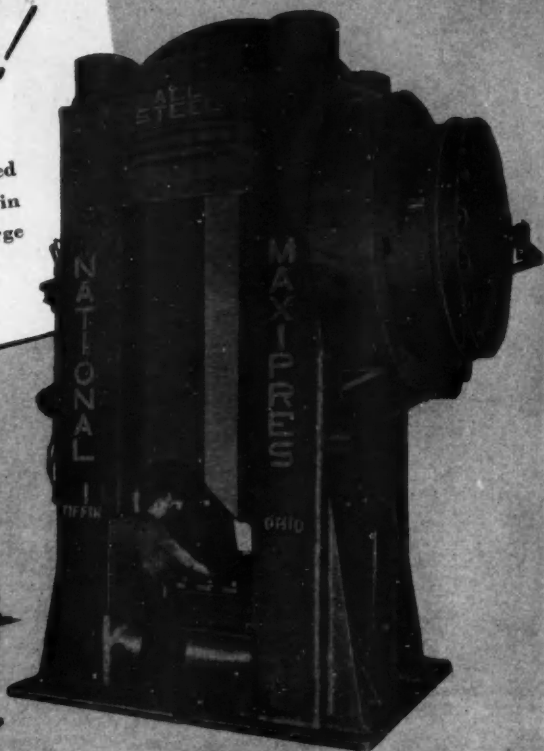
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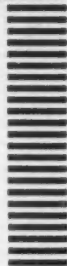
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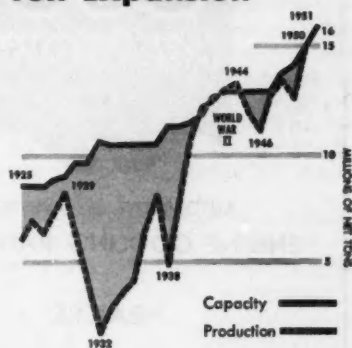
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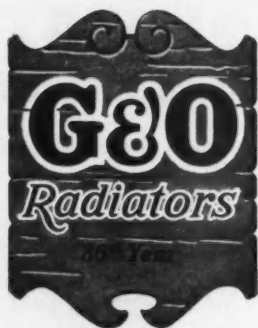
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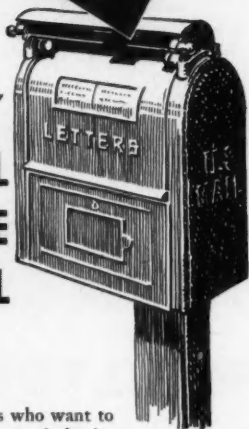
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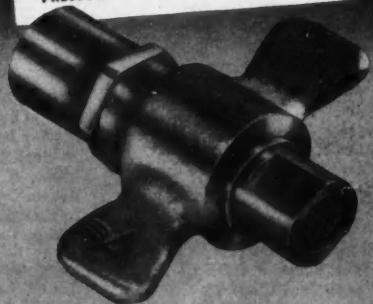
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REO	CUMMINS
MACK	

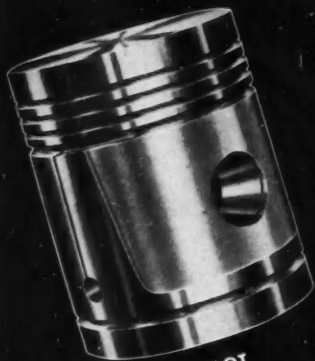
# **ZOLLNER**

## **PISTON EQUIPMENT**

*for* **INTERNAL COMBUSTION ENGINES  
— BOTH GASOLINE AND DIESEL**

**ZOLLNER MACHINE WORKS, FORT WAYNE, IND.**

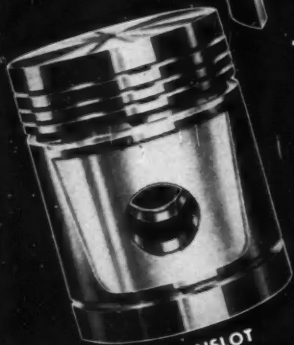
**"Makes Any Engine a Better Engine"**



**T SLOT**

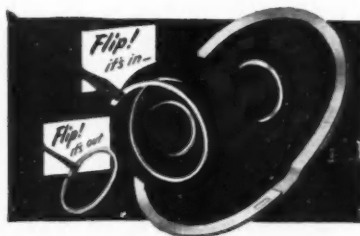


**"STEEL BELTED"**



**TRANSLOT**

Spirolox saves machining • assembly time • parts • space • weight



you hold moving parts together **Better**

... surer, quicker, less expensively

with *Spirolox!*

Spirolox Retaining Rings spiral into place easily. And as they do, you score in several ways: The part is positioned to closest tolerance, and locked-in firmly . . . Yet in shop or field it is freed with the flip of a screw driver, and the ring is ready for re-use . . . In line or hand assembly this fastening method takes much less time . . . Spirolox brings lighter, simpler, more compact machine design . . . Spirolox cuts out parts and machining formerly used in fastening components . . . And—you have the satisfaction of knowing that this fastener will stay put . . . A respectable handful of betterments!

#### BASICALLY RIGHT DESIGN

When you spiral-in a Spirolox Retaining Ring, one more part is positioned precisely and locked securely. Due to its two-turn coil construction, Spirolox locks in the groove under thrust, will carry loads up to its full shear strength—will not jump out or squeeze out. Due to the lighter weight of Spirolox, centrifugal force does not tend to affect its locking characteristic.



gapless • concentric • requires no special tools • easy-in, easy-out • re-usable • stays put

Spirolox Retaining Rings are covered by United States Patent No. 2,450,425 and Foreign Patents. Other patents pending. Copyright 1948 Ramsey Corporation.

Product of Ramsey Corporation, for 31 Years Makers of Original Equipment and Replacement Piston Rings. Office: 3704 Forest Park Boulevard, St. Louis 8, Missouri. Factories: St. Louis and Sullivan, Missouri; Fruitport, Michigan; Toronto 8, Ontario, Canada.

G-2966R